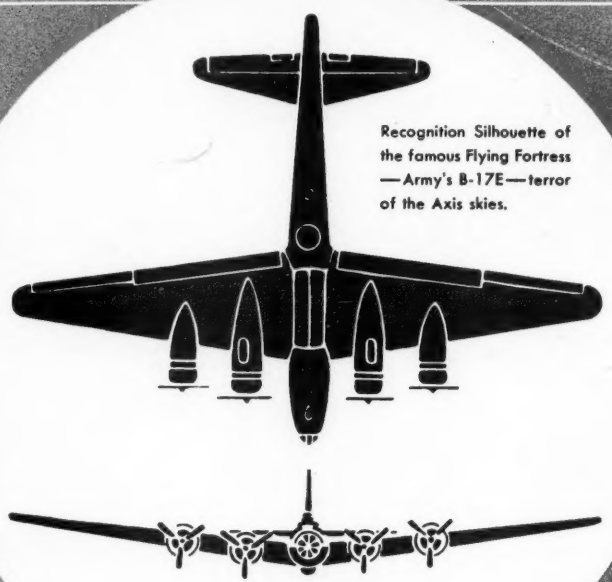
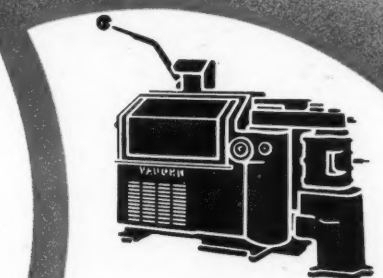
WIRE AND WIRE PRODUCTS

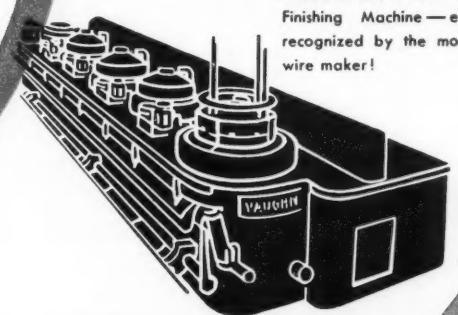
JULY 1943



Recognition Silhouette of the famous Flying Fortress —Army's B-17E—terror of the Axis skies.



Silhouettes of the Vaughn HR Motoblox and HF Continuous Finishing Machine — easily recognized by the modern wire maker!



Closely **IDENTIFIED** *with building our Birds of War...*

Bomber or fighter; reconnaissance plane, transport or trainer—our warplanes all use wire in tremendous quantities . . . much of it produced by Vaughn Wire Drawing Machinery, with speed, safety and stamina geared to the job!

VAUGHN

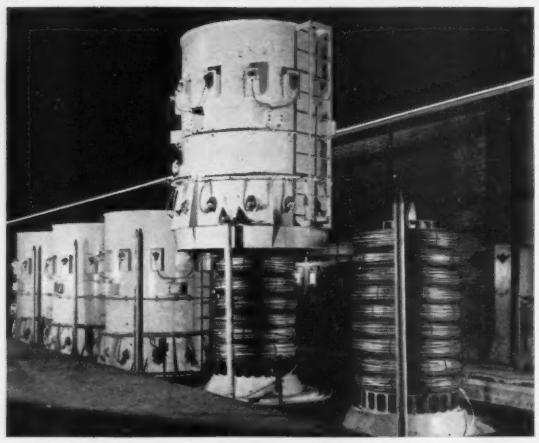
WIRE DRAWING MACHINERY

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT
Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

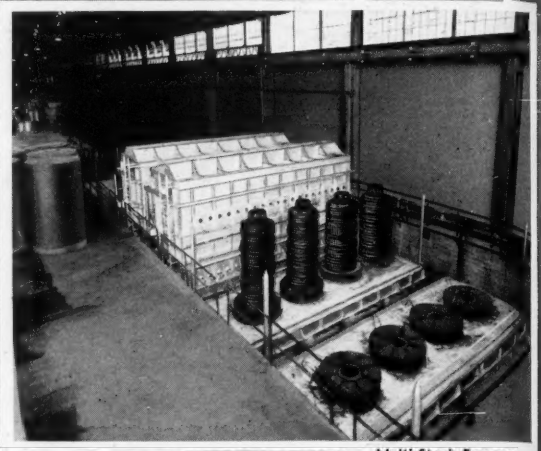
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

ANNEALING FURNACES *for* ROD & MERCHANT MILL PRODUCTS



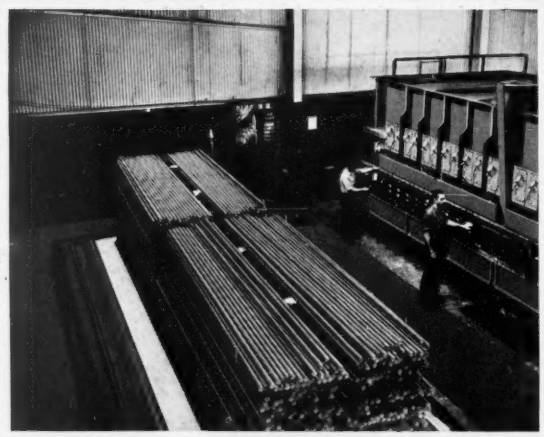
Single Stack Furnaces for Rod Coils

• The Wilson Annealing Unit is covered by Patents Numbers 1952402 2068477 2078356 2081612 2089843 and other patents pending.

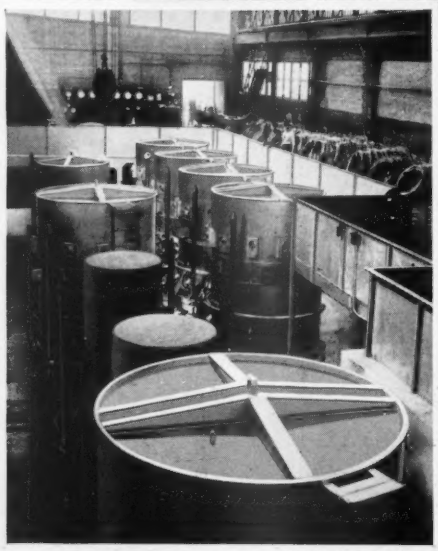


Multi-Stack Furnaces for Rod Coils

Coil Spheroidizing for Cold Heading Plant



Rectangular Bell Type Furnace for Long Straight Bars



Bullet Core Coil Annealing

COMPLETE WITH

GAS ATMOSPHERE EQUIPMENT,

SPIDERS, COIL LOADING AND

STRIPPING MACHINES

Lee Wilson

ENGINEERING Co., Inc

20005 West Lake Road CLEVELAND, OHIO

Telephone ACademy 4670

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

Get 4 to 5 Times Longer Mandrel Life with This IMPROVED-TYPE Mandrel

Carboloy improved type mandrels give you an extra safety measure of strength, an extra high quality of surface polish, plus a grade of carbide especially suited to resist the abrasive wear of tube drawing. These outstanding features provide longer periods of continuous operation, better finish and more uniform wall thickness. (Users report four to five times longer life and a quality of finish far exceeding that obtained with older styles of carbide mandrels.)

Of particular interest to many mills is the steady increase in use of Carboloy mandrels for drawing steel tubing, and their application to the drawing of cupronickel and other alloy tubing vital to war production.

Carboloy mandrels are available to you in the form of finished mandrels, finished mandrel nibs ready for mounting, and rough mandrel nibs. You'll find complete listings on pages 10, 11 and 12 of catalog D-114. Gladly sent on request.

★ ★ ★

Latest Training Services: (1) Carboloy Training Course for die or mandrel room supervision— (2) Training Film "What Is Carboloy Cemented Carbide?", a 35 mm silent film strip, available at $3.50. Provides basic understanding of cemented carbides and their manufacture. Booklets available describing both services.

CARBOLOY COMPANY, INC., DETROIT, MICH.

TRADEMARK

Sole makers of the Carboloy brand of cemented carbides

Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle

Authorized Distributors: Canadian General Electric Co., Ltd., Toronto, Canada; Hartley Wire Die Co., Thomaston, Conn., Michigan Wire Die Co., Detroit, Mich.

Foreign Distributor: International General Electric Co., Schenectady, N.Y.

CARBOLOY CEMENTED CARBIDES

TRADEMARK

COMPLETE DIE SERVICE FOR WIRE, BAR, TUBING AND SHEET METAL

Suppose it happened. Not a test, this time; the real thing. An aircraft spotter, perhaps in some remote island outpost, suddenly freezes to attention, peers through binoculars . . . leaps to his telephone.

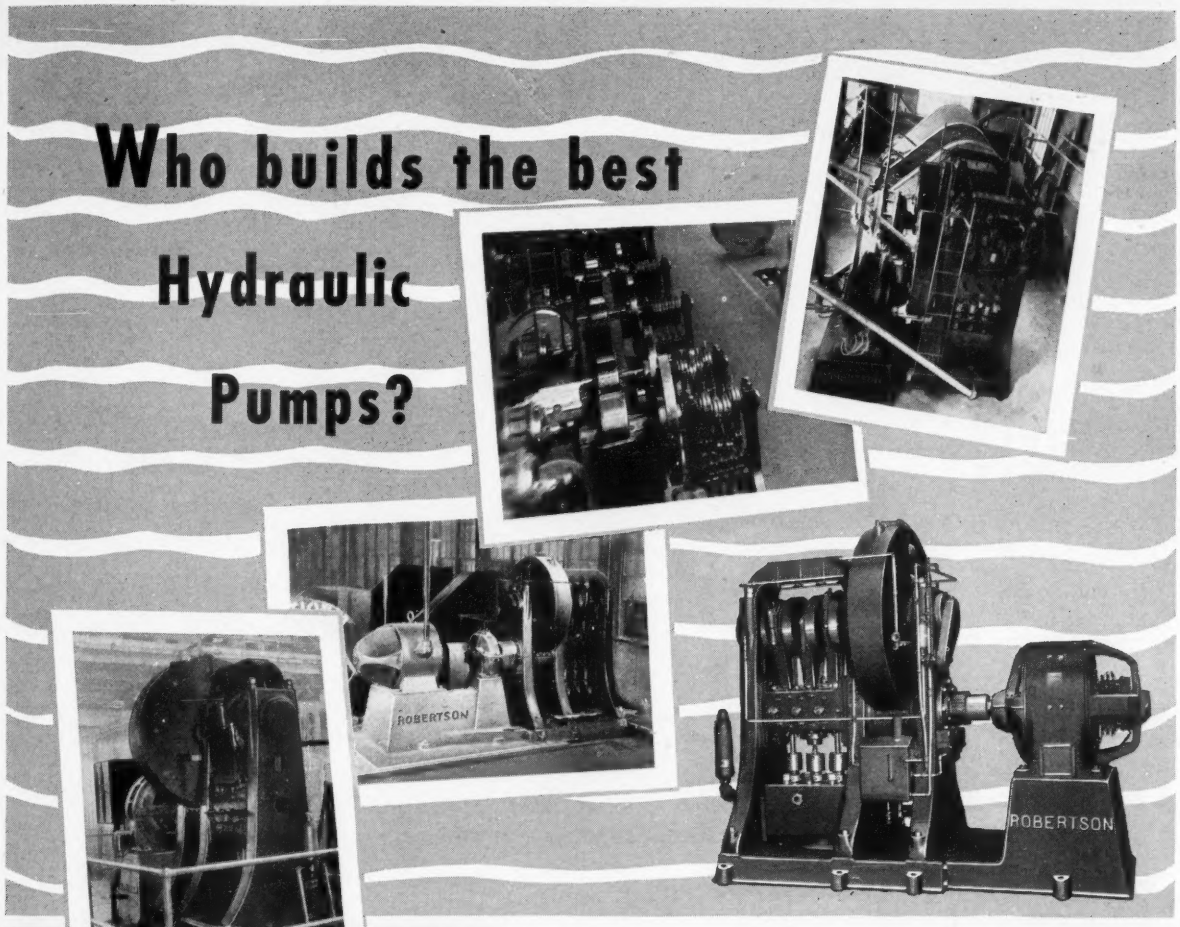
"Enemy planes!" . . . Up and down the coast his message flashes. Myriads of wires relay it, under rivers, over mountains, to airfields and anti-aircraft batteries. Sirens howl. Pilots scramble into cockpits, and dozens of fighter planes roar upward into the sky.

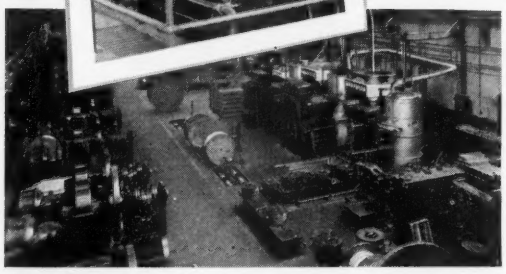
America's coast defense system is tied together by a communication network of wire. In an emergency, this network runs the show, coordinates the interceptor command and helps protect civilians in the cities against falling bombs.

Bethlehem is supplying many tons of bethanized (electrolytically zinc-coated) wire to armor the underwater cables of this vast coastal communications net. We also furnish, through distributors, many miles of telephone wire for use by the U. S. Coast Guard on both the Atlantic and Pacific coasts. This is but one of the many ways in which Bethlehem wire mills are working to protect the home front and to speed the day of victory.

BETHLEHEM STEEL

Who builds the best Hydraulic Pumps?





FIRST CHOICE *for* all *cable lead encasing equipment, among all cable makers, is Robertson. Robertson presses, die-blocks, operating valves and closed lead melting pots, as well as hydraulic pumps, make complete installations in the plants of the* majority *of cable manufacturers.*

ANSWERING YOUR QUESTIONS *about the construction and operating details of Robertson Pumps and complete Cable Lead Encasing Equipment, these two fact-packed bulletins will be sent free upon request on your letterhead. Write for them* NOW; *there's no obligation whatsoever.*

Free!

WE LET Robertson High-Pressure Hydraulic Pumps "speak for themselves." Which they do very well. For—to the engineer, even a cursory survey of the construction advantages of Robertson Pumps foretells the operating economy and endurance which are their outstanding characteristics in the eyes of production executives.

As a result, a majority of the leading makers of lead encased cables in the United States and Canada have chosen Robertson Pumps—and, very apparently, have had their judgment fully supported, for they have re-ordered again and again over periods of years!

JOHN ROBERTSON CO., INC. 125-37 Water St., Brooklyn, N. Y.

ROBERTSON

Established 1858 **• Designers and builders of Lead Encasing Machines and Hydraulic Equipment, Including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-Pneumatic Accumulators, Lead Sheath Stripping Machines, and Special Equipment for Special Uses.**

TO GET THE ULTIMATE *Use*

Vascoloy RAMET

T. M. REG. U. S. PAT. OFF.

TANTALUM-TUNGSTEN CARBIDE DIES

FOR DRAWING	For drawing fine wire, heavy wire, special shapes, tubing, etc. For shell and cartridge cases from the blank to completed case.
FOR COLD HEADING	Rivets and any number of small upset parts required in large quantities to close tolerance.
FOR COLD NOSING	Artillery shells.
FOR EXTRUDING	For extruding operations on a wide variety of parts because of quantity and tolerance requirements.

MORE PRODUCTION, BETTER FINISH, AND CLOSER TOLERANCE—these characterize the high performance of Vascoloy-Ramet Tantalum-Tungsten Carbide Dies. All these factors contribute to getting the ultimate with drawing, cold heading, and extruding dies.

TANTALUM-TUNGSTEN CARBIDE DIES are now used for countless forming, nosing, drawing, cupping and extruding operations on articles of war materiel. Our special die department offers its services and experience to manufacturers making products requiring these operations.

If carbide dies can be used to advantage, we will design and produce Tantalum-Tungsten Carbide Dies that will assure you the ultimate in performance.

437

Ramet

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES • IN CANADA: CARBIDE TOOL & DIE CO., LTD., HAMILTON, ONT.

TANTALUM-TUNGSTEN CARBIDE

FOR HIGH PERFORMANCE • • • *Specify* Vascoloy RAMET DIES

KEEP EXTRUDERS *in the FIGHT!*

Proper Lubrication Pays!

The obligation for servicing Royle extruders is shared between Royle and our grand customers. Our 100% War production precludes the intimate touch with customers we at Royle covet. Thus, we must pass along to you the task of guarding your producing extruders against faulty lubrication.

Your machines are running at 24 hour top speed. Please keep them properly lubricated. If in doubt as to the proper lubrication policy to follow, write us. Send size, type (marine, ball or roller thrust bearing . . . spur, worm or herringbone gears).

Believe us, we want to keep you running.

JOHN ROYLE & SONS

PATERSON, N. J.

AKRON: J. C. CLINEFELTER **LONDON: JAMES DAY (MACHINERY) LTD.**

By doing many things a little faster, J&L is producing more steel for war

COPYRIGHT 1943 — JONES & LAUGHLIN STEEL CORPORATION

FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

TEAMWORK POURING STEEL BACKS UP OUR FIGHTING MEN

America's steel mills today are producing steel for war at the all-time high rate of 95 million tons a year. This averages enough steel in one second's time to make four jeeps — a dozen gun-shields.

In the illustration you see a skilled crew pouring molten steel into man-high molds to become ingots — unit measure of steel production — steel in its first solid form. The men on the platforms and the cranemen maneuvering the huge ladles from aloft, make up real All-American teams, typical of those all along the steel front of 650,000 workers who are employing all their skill and teamplay to make every second count against the enemy and toward saving American lives on the battle fronts.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

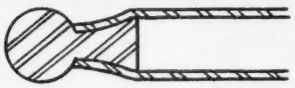
CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

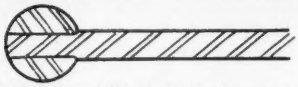
New "STANDARD" HYDRO-FORMER

SHAPES AND JOINS METALS WITHOUT CUTTING . . .

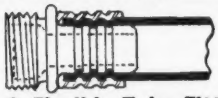
TYPICAL APPLICATIONS



Tube Attachment to Solid Fitting



Ball and Rod Attachment



Hose & Flexible Tube Fittings

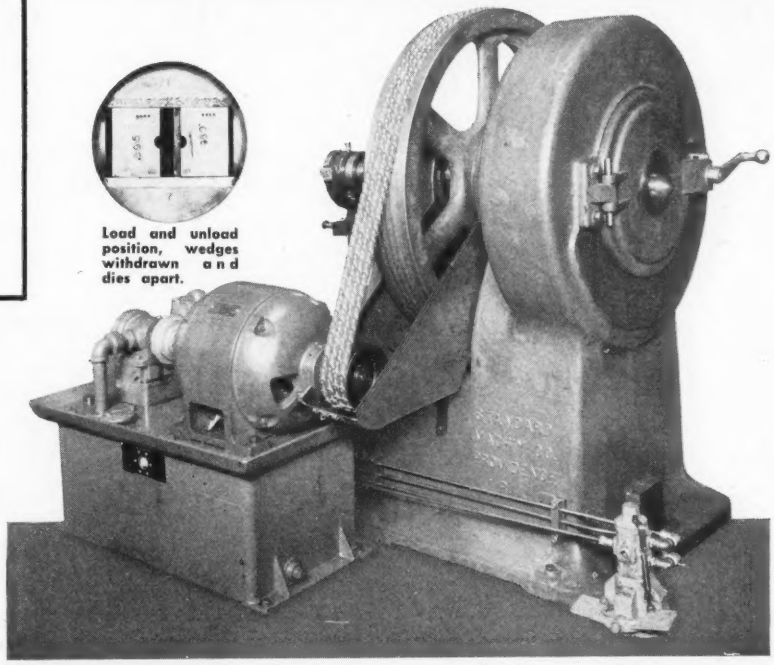
Metal Forms from Solid Bars

Union of Tubes

Cable Attachment and Electrical Terminals

In one operation, this machine connects tubing or cables to solid fittings, or forms metal sections from solid bars without cutting. A feature of its design is the use of hydraulically-operated wedges to compress the dies so that swaging force is applied at right angles to the work . . . not obliquely as with tapered dies. In reducing outside diameter of tubing, therefore, tendency toward elongation is lessened and thickness of tubing wall is increased. Fittings having large ends can be put into machine without removing dies. This machine simplifies handling of many other operations which previously required more complex, time-consuming methods.

Load and unload position, wedges withdrawn and dies apart.



Saves

TIME
LABOR
METAL

Further information on request

STANDARD MACHINERY CO.
PROVIDENCE RHODE ISLAND

The Annual Convention of The Wire Association

will be held at the

LaSalle Hotel, Chicago, Ill., October 18-22, 1943

(Simultaneously and in conjunction with the National Metal Congress)

MAKE YOUR PLANS FOR THE 1943 CONVENTION TODAY.

The technical sessions that have been set up by the Program Committee, details of which will be released soon, represent an all-time high in subjects of vital and timely interest to the Wire Industry. Arrange to attend this Convention; you, your Company and our Country will be well repaid for the five days spent there.

FIRST, please reserve your room or suite at the LaSalle NOW. Hotel accommodations will not be plentiful and you can avoid confusion and much personal inconvenience by attending to this promptly.

SECOND, if your Company plans to have an exhibit at the Metal Show, kindly arrange for this as soon as possible. Tell us what you want and we will see that you get details and prices and floor plans.

The 1943 Convention will make history. It will be packed with useful information that you can use in your fight to put down the Axis. Our objective and yours is to win the war and win it in the shortest possible time. To be successful, the Convention needs your active cooperation. We've had it in the past and the Industry needs it more than ever this year. Come to learn! Come to give! Come to extend your acquaintanceship and to renew old friendships. Your co-operation can begin by attending to all details early.

About Advertising

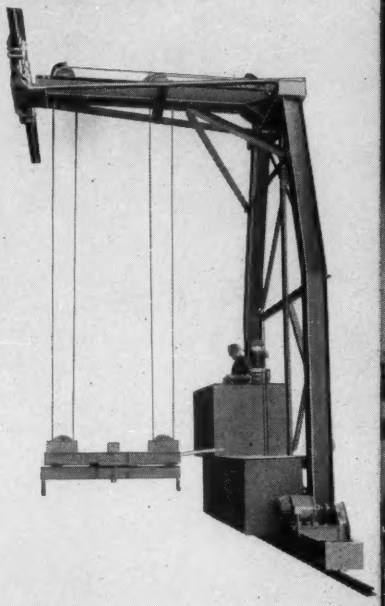
As to advertising in WIRE & WIRE PRODUCTS, to those who have space on order, get the copy prepared early and send it in; if you have not ordered space yet, will you please write or wire telling us what to reserve? The paper supply is limited and printers are short-handed and we must know well in advance what to provide for. Will you not let us have this information promptly? This is our Convention issue and space is limited; first come, first served!

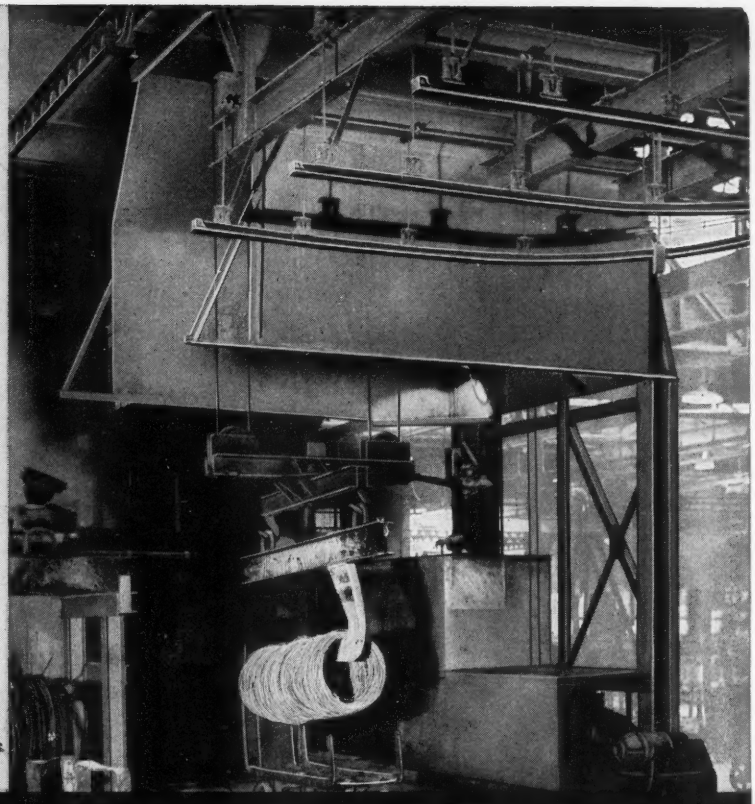
THE WIRE ASSOCIATION

300 MAIN STREET • STAMFORD, CONN.

Richard E. Brown, *Secretary*

One of the two gantry cranes serving parallel lines in the cleaning house of The Steel Company of Canada, Hamilton, Ontario. The crane below is the same as at right, before it was shipped from the Cleveland Tramrail factory. All electrical and hoisting machinery are away and protected from the acid and fumes.





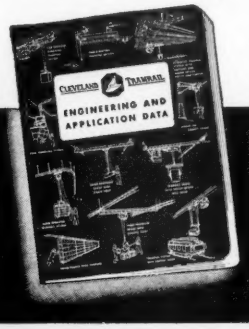
SPEED PRODUCTION

. . . *in the* CLEANING HOUSE

Cleveland Tramrail cleaning house gantry cranes have revolutionized operations in the cleaning houses of many wire and wire products plants. They enable one man to perform all operations in the cleaning house — acid bath, rinse, lime dip, bake — and of significance more tons can be cleaned per day than by customary methods. Consequently the cost per ton of rod cleaned is far less by the Cleveland Tramrail way.

There are other advantages. A straight cleaning house layout with a Cleveland Tramrail gantry crane requires less space, enforces cleanliness, orderliness and better working conditions.

The degree of success which wire producers and fabricators attain in the days ahead will depend upon their methods and equipment. Now is the time to begin giving serious thought to your cleaning house as well as to the other departments of your plant. Our engineers will be glad to give you the benefit of their many years of practical experience.



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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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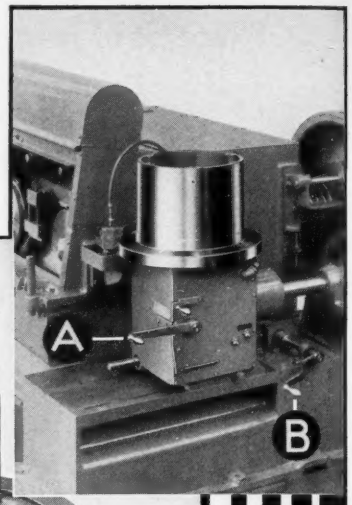
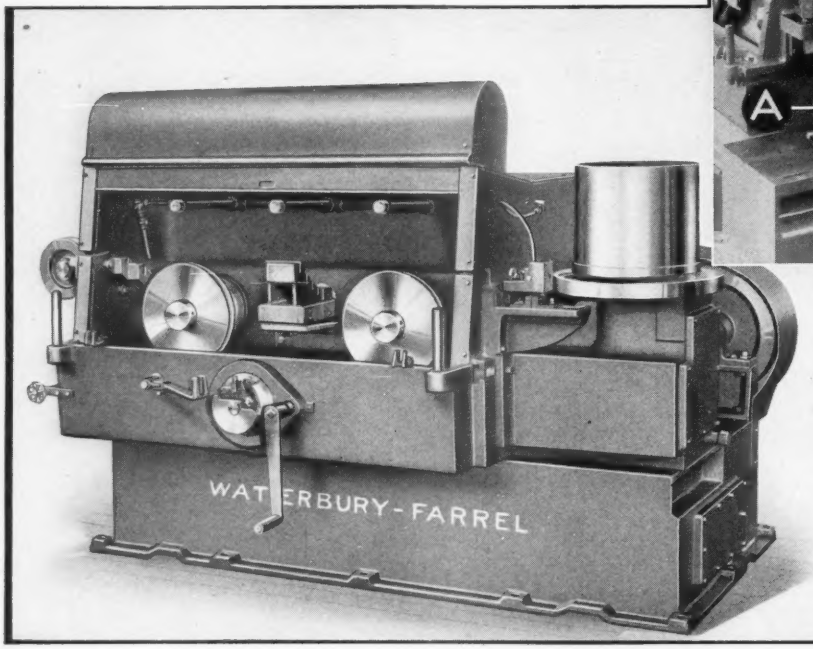
THE CLEVELAND CRANE & ENGINEERING CO.
1141 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

WIRE DRAWING MACHINES





FOUNDED WATERBURY FARREL 1851

by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.
Two conveniently located removable handles do the trick in jig time—

A — changes direction of rotation
B — shifts position of block - - -

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

• WIRE AND ROD MACHINERY • COLD HEADING MACHINERY, ETC. •

WATERBURY FARREL
FOUNDRY & MACHINE COMPANY
WATERBURY • CONNECTICUT • U•S•A

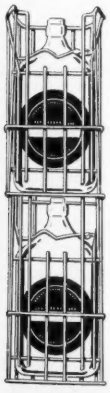
CHICAGO CLEVELAND NEWARK, N. J.

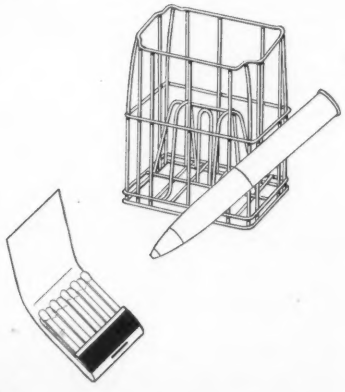
WHAT CONTINENTAL STEEL IS DOING BETTER FOR WAR TODAY ★ IT WILL DO BETTER FOR YOU TOMORROW ☆ ☆ ☆

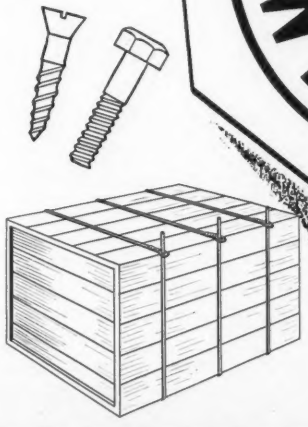
From rods to be forged into hand tools to fine gauge wire for special screens, Continental manufacturer's wire is being made to meet exacting wartime requirements. This production of wire to meet the varied demands of war is building new resources and facilities at Continental which will be at your call when war needs are satisfied. Continental will be better equipped than ever to meet your needs in a wide range of sizes, shapes and coatings of wire. Call on Continental engineers to work with you on present problems, and plan with you for new products and post-war production.

CONTINENTAL STEEL CORP., KOKOMO, IND.

Plants at Canton, Kokomo, and Indianapolis







CONTINENTAL STEEL CORPORATION

SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.

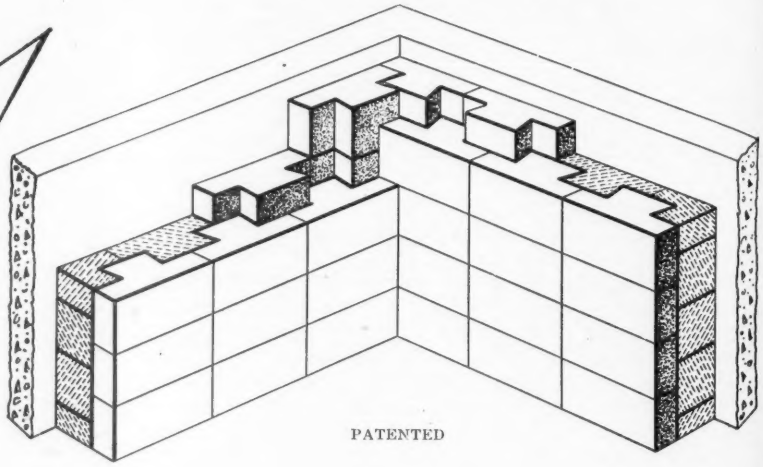
WIRE: Bright Basic, Annealed, KONIK, Copperized, Tinned, Special Manufacturer's, etc.

NUKEM ACID TANKS

NUKEM SERVICE

1. COMPLETE PROPOSITIONS
2. CAREFULLY ENGINEERED DESIGNS
3. DETAILED SPECIFICATIONS
4. SPEEDY DELIVERIES
5. EXPERT SUPERVISION
6. GUARANTEED INSTALLATIONS

BRICK LINED MONOLITHIC CONSTRUCTION



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MANUFACTURERS OF CORROSION RESISTANT MATERIALS:

PLASUL BASOLIT	NU-MASTIC
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SYNCRO STRANDING MACHINES

incorporate

every proved advantage

The practical ideas of men who actually produce stranded wire — and who know what they want in stranding machines — are incorporated in Syncro Stranding Machines. For this reason, we believe Syncro Stranding Machines are the finest machines of their type available today.

Among the inherent advantages of the Syncro Stranding Machine are such features as all welded rotor construction, with spool loading openings of ample size . . . quick-acting, safe spool locks . . . adjustable wire tensions . . . non-metallic support rollers mounted in adjustable bearings . . . tungsten carbide wire guides . . . "V" belt motor drive through centrifugal type coupling . . . automatic broken wire stops . . . effective brakes . . . and a rotor that is dynamically and permanently balanced to provide operation with an absolute minimum of vibration. Built in seven and twelve spool capacity.

The seven spool machine shown can be equipped for one additional core strand. Twelve spool machines can also be arranged for an additional core strand. Rotation in either direction and machines are built "right hand" or "left hand" to suit requirements.

Write for complete details.

Syncro Stranding Machines are manufactured under license arrangement with New England Butt Co.

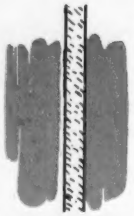
SYNCRO MACHINE COMPANY

RAHWAY, NEW JERSEY
McCORMICK BLDG., CHICAGO

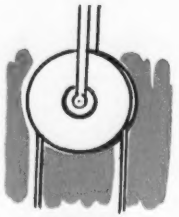
REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

Machinery for the Wire Industry

SYNCRO



TWIST



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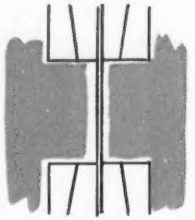
TENSILE



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- Made with 5, 6, 7 and 8 drafts.
- Machine is designed to draw from welded bundles.
- Interchangeable finishing blocks 16 and 12 — 16 and 8 — 12 and 8.
- Maximum starting size .135″ hard drawn low carbon or high carbon patented 170,000 #/in².
- Fully adjustable die boxes for casting wire.
- Finishing speeds to the capacity of the motor.

W-87

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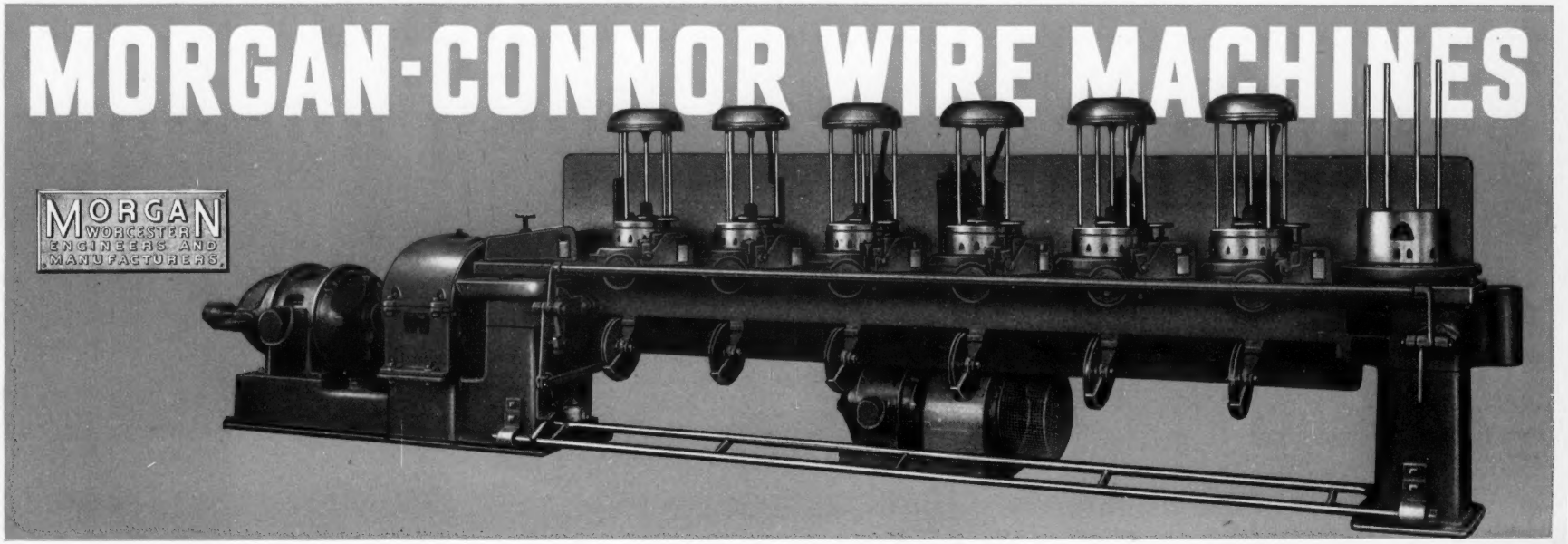

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 18 JULY, 1943 No. 7

Designated as

Official Publication By The Wire Association

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 18 JULY, 1943 No. 7

War-Time Disposal of Waste Pickle Liquors

By Wallace G. Imhoff,
President of The Wallace G. Imhoff Co.,
Vineland, New Jersey

Treating waste pickle liquors by the basin method. ✦ ✦

General Statement

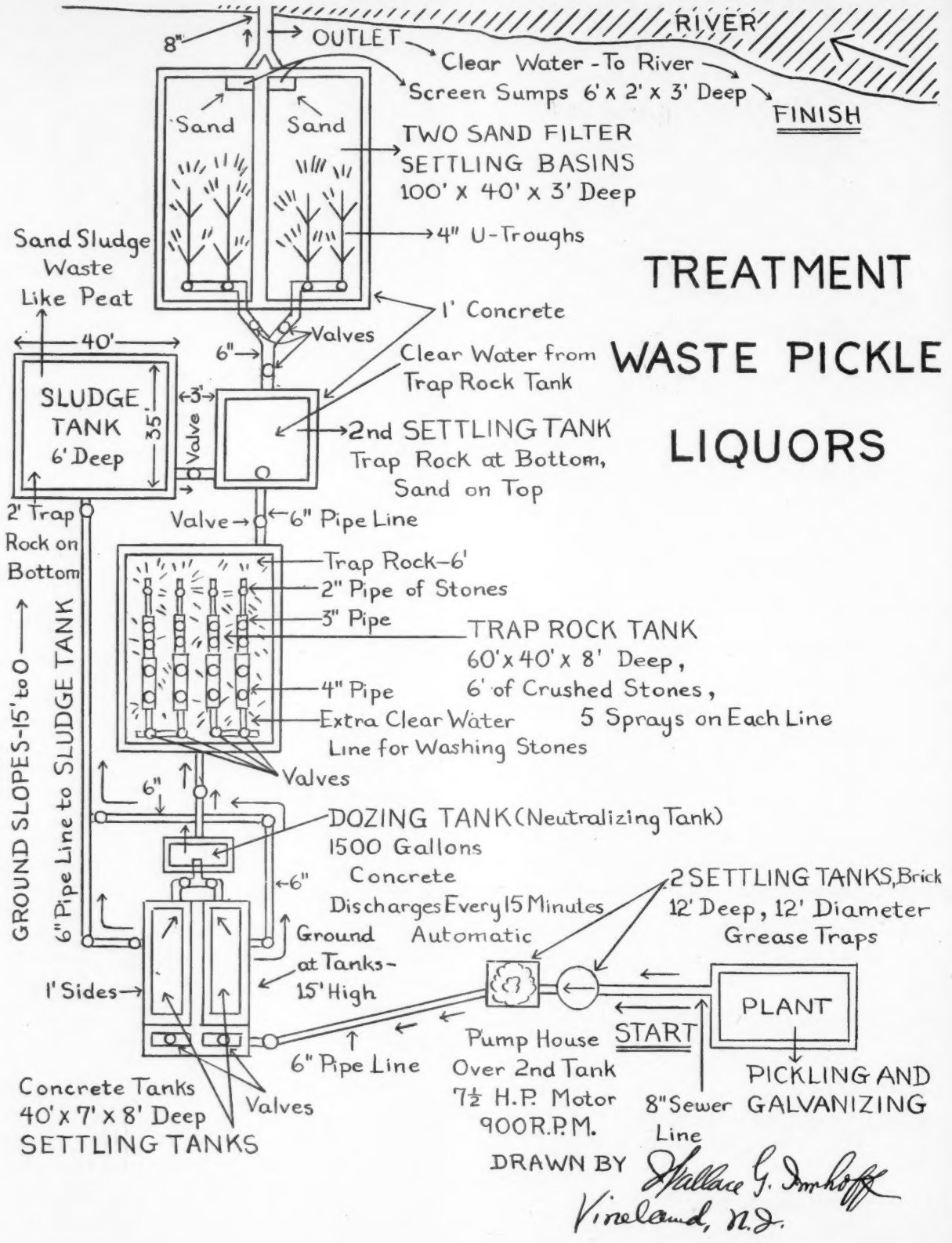
PICKLING of iron and steel for various finishing processes for the war effort means that the disposal of waste pickle liquors, which was a serious problem even in peace time, is now a much more aggrevated one in war-time. It is almost unbelievable that from one small plant alone 1,439,405 pounds of iron, or approximately 719 tons of iron were run into the river in one year. The estimated waste pickle liquors was 3,100,800 gallons of sulphuric pickle liquor, and 1,018,400 gallons of waste muriatic acid liquor, giving a grand total of 4,119,200 gallons of waste pickle liquor. The estimated loss of good acid in this liquor was 12%, of total acid purchased.

✦ ✦ ✦

IF this figure of 4,119,200 gallons of waste pickle liquor, and 719 tons of iron run into the river from just one small plant, in a large industrial city, the total pollution of the river from all plants must be almost unbelieveable. It accounts for the iron-stained rocks everywhere in the river when it is low, and the condition of the drinking water taken from the river. Today in war-time the condition is much more aggrevated, and therefore any practical means of relieving the situation should receive careful study as a war-time emergency measure to not only control this loss of iron and acid, but also to safeguard the health of the public in the communities where this stream pollution is on a large scale. The following method is not a theoretical method, not just another method just to make words and discussion on the subject of the treatment of waste pickle liquors, but an actual practical method that has been in use satisfactorily in a small plant for the past twenty years. The writer personally saw the plant in operation and tasted some of the clear, uncontaminated water, that flowed into the river from this waste pickle liquor treating plant. It is so effective, and so practical, and is doing such a "good job", that it should not be even thought of theoretically, but as an actual practical solution of this waste pickle liquor problem already working for many years.

WALLACE G. IMHOFF
President of The Wallace G. Imhoff Company, Vineland, N. J., and Technical Director of Research, American Hot-Dip Galvanizers Association, Pittsburgh, Pa.

Designated as Official Publication by the Wire Association


RIVER
8"
OUTLET
Clear Water - To River
Screen Sumps 6' x 2' x 3' Deep
FINISH
Sand
Sand
TWO SAND FILTER
SETTLING BASINS
100' x 40' x 3' Deep
4" U-Troughs
Sand Sludge
Waste
Like Peat
TREATMENT
WASTE PICKLE
LIQUORS
1' Concrete
40'
Valves
6"
Clear Water from
Trap Rock Tank
SLUDGE
TANK
6' Deep
35'
3'
Valve
2nd SETTLING TANK
Trap Rock at Bottom,
Sand on Top
2' Trap
Rock on
Bottom
Valve
6" Pipe Line
Trap Rock-6'
2" Pipe of Stones
3" Pipe
TRAP ROCK TANK
60'x40'x 8' Deep,
6' of Crushed Stones,
4" Pipe
5 Sprays on Each Line
Extra Clear Water
Line for Washing Stones
Valves
GROUND SLOPES-15' to 0
6" Pipe Line to SLUDGE TANK
6"
DOZING TANK (Neutralizing Tank)
1500 Gallons
Concrete
Discharges Every 15 Minutes
Automatic
2 SETTLING TANKS, Brick
12' Deep, 12' Diameter
Grease Traps
6"
Ground
at Tanks-
15' High
1' Sides
PLANT
START
Pump House
Over 2nd Tank
7½ H.P. Motor
900 R.P.M.
6" Pipe Line
8" Sewer
Line
PICKLING AND
GALVANIZING
Concrete Tanks
40' x 7' x 8' Deep
SETTLING TANKS
Valves
DRAWN BY
Wallace G. Imhoff
Vineland, N.J.

A General Description of the Method

THE method has been called by the writer, **The Basin System of Treating Waste Pickle Liquors,** because the process and the equipment is one of a series of passing the liquors on from one basin to another, treating chemically, and finally emptying a clear, tasteless, acidless, **harmless water,** back into the river.

✦ ✦ ✦

IN the plant where the **basin system of treating waste pickle liquors** is in operation, the waters not only contain waste pickle, but other plant waters containing oils from the machine shop, and other shops are also run into sewers which find their way into the same disposal and treatment basins. All the sewer lines from the plant run into two brick settling tanks about one quarter of a mile away from the plant in an open field. These two settling tanks are made of acid-proof brick, and are 10 to 12 feet deep and about 12 feet in diameter. In addition to being settling tanks they are also grease traps, and catch oils and grease, sand, and other water refuse that runs into the sewers from the plant.

✦ ✦ ✦

THE first settling tank leads to the second through a large 6 to 8-inch drain pipe. The second settling tank is entirely enclosed in a wooden shed, and a 7½ H.P. pump and motor are installed in this shed. The pump has a speed of about 900 R.P.M. A 6-inch pipe line leads from these first two settling tanks on over into the field about a quarter of a mile away. Here is where the main basin system treatment is located. The whole system of tanks has been built over the side of an artificially constructed hill-side. This hill was made by dumping many carloads of sand on this spot. The first set of tanks are on top of the hill, at least 15 feet or more above the main ground level. The tanks are two very large concrete, acid-proof brick-lined tanks built in one large installation with the dividing-wall through the middle.

THESE two tanks are each 40 feet long by 7 feet wide by 8 feet deep. The sides of the tank are 1 foot thick. The six-inch pipe line from the two grease traps, or settling tanks just outside the plant, leads up into these two large tanks on the hill. The solutions are pumped up through the 6-inch line from the pump in the second settling tank, or grease trap. These first two tanks on the hill act as settling, or clearing tanks. The solutions are allowed to stand and clear themselves, the sludge, sand, and other heavy material settling to the bottom of the tanks.

✦ ✦ ✦

THERE are four valves in the lower end of these two tanks. Two of these valves, one from each tank, leads into one main line with a valve that flows into another tank by gravity, and called the "dozing tank". This is a neutralizing tank and contains lime, or any suitable neutralizing agent. Most of the sediment has already settled out in the first two large settling tanks, so that the liquors, which flow into the "dozing tank" are perfectly clear liquors, but may contain acid and iron in solution. Two other very large valves are also located in the ends of these first two settling tanks on the hill. These valves when opened, lead into a 6-inch line from each tank, which runs down hill to another very large tank called the "sludge basin", or "sludge settling tank". This tank is 40 feet long by 35 feet wide, by 6 feet deep. The bottom is covered with two feet of crushed trap rock, and on top of the trap rock is sand. The liquors from the first two settling tanks are run off, and the valves leading into these tanks closed. The material which has settled to the bottom of these first two tanks is then stirred up heavily, and the sludge and settlings washed out, down into this large 40-foot "sludge basin".

✦ ✦ ✦

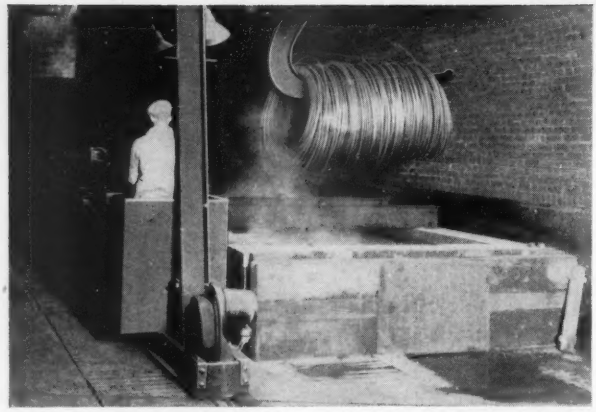
A CLOSE examination of the materials washed into this sludge settling basin shows the settlings to be mainly sand intermixed with greasy sediment. The color is like bog ore, a yellowish iron sand almost of peat consistency.

✦ ✦ ✦

THE "dozing tank" is situated right below the two large settling basins. This tank is a 1500 gallon tank made of concrete, and lined with acid-protecting material. The valves from the settling tanks lead into the dozing tank where the clear, or greenish acid waters are treated with lime to neutralize the acid and precipitate out the iron which may be in solution as ferrous sulphate. A very large discharge line leads from the dozing tank down into another very large "trap-rock tank". This tank is 60 feet long by 40 feet wide, and is 8 feet deep. The wall of this tank is a 9-inch acid-proof brick wall. The tank is filled with 6 feet of small crushed pieces of trap rock. The pipe line from the dozing tank is a large 6-inch line, and on entering the "trap-rock tank" splits up into four spray lines. These four spray lines start at 4-inch size, then go to 3-inch, and finally down to 2-inch lines. Each spray line has 5 sprays on it which work automatically every fifteen minutes when the dozing tank becomes full, and is automatically discharged into the large trap-rock tank. The discharge waters from the dozing tank flow into the four lines, and out through the 5 sprays down over the trap rock, where they filter through and go into a "secondary settling tank" just three feet away from the sludge settling tank.

✦ ✦ ✦

THE secondary settling tank is 20 feet long by 15 feet wide, by 6 feet deep. The clear water from the trap rock tank above runs into this "secondary settling tank". In all of the tanks the water is open to the air and the action of the air gives an oxidizing action changing any ferrous sulphate, or ferrous iron, to the ferric iron, or light yellow iron rust. The water itself however in most cases is absolutely clear water, and when tasted had only the very faintest taste of iron. This discharge line from the trap-rock tank into the secondary set-



Wire Pickling.

tling tank is 6 inches, and the water is absolutely clear water.

✦ ✦ ✦

THE two basins are "sand filter beds", and are settling basins 100 feet long by 40 feet wide and 3 feet deep. The two basins are connected by a single wall between them common to both basins. The bottom of these tanks is covered with 1 foot of crushed trap rock and on top of the rock is 2 feet of sand for filtering purposes. The one large 6-inch main outlet from the secondary settling tank splits into a Y and this again has a 3-inch pipe leading from each leg of the Y over toward the outside edge of the settling basin. There are two outlets from this cross-line down into each settling basin. So that the water will not make a hole in one spot, troughs are provided to each outlet so that the water can be divided, and run gently onto the sand. Each trough has one main half-pipe about 4 inches in diameter that runs about 20 feet down on the filter bed. There are four side leads from each main half trough extending out to the sides of the bed about 8 feet. The troughs resemble bird, or chicken feet marks, in the tanks. There are four outlets onto these beds, and each outlet has its own set of troughs dispersing the water uniformly over the filter bed. At the lower end of these two settling filter beds, and right at the center wall of the two tanks there are two sumps containing large screens, one drain sump for each filter bed. Here the waters receive a final screening before entering an 8-inch pipe line leading out into the river below.

✦ ✦ ✦

ATTENTION is now called to the water that is discharged into the river. First it is **perfectly clear water.** The writer tasted it to see if there was any acidity left in it, and the only thing that could be tasted was a "flat taste" perhaps **very slightly iron,** but so slight that a person not knowing the taste of iron in waters, **would not even recognize it.** The waters discharged **are perfectly clear,** and **absolutely harmless,** as they are finally discharged into the river. Another very important fact that attention is called to is that **the whole system was absolutely odorless.** There was no sign of any kind of odor anywhere. The beds are changed over every other day. The waste from the large filter beds is mostly oil and grease cake, and there is very little of this. The clear waters that flow into the river are tested for acid and iron content every day by the plant chemist, and the whole system is said to be one of the very best in existence for the practical treating of waste pickle liquors. There has never been a complaint to this plant for the character of the waters it runs into the river.

✦ ✦ ✦

THIS system has **been in continuous operation for about 25 years,** and there has been practically no repairs. The tanks are built of concrete and brick-lined, and are sturdy. The whole system does of course from time to time need attention to clear out the filter sands, and remove the sludge deposited in the upper tanks. The original cost of the system was about $10,000, but the writer estimates that the same system today installed with modern acid-proof brick tanks, etc., would cost from $20,000 to $25,000 for the same size. Small systems can of course be installed cheaper to meet the needs of smaller plants; the same system can be used in any size desirable. A flow sheet diagram of the system is herewith submitted to give a clear picture of all that has been described. It is the finest, and most practical method of treating and disposing of waste pickle liquors that the writer has ever seen, and the water going into the river after the treatment of the liquors was much better tasting than some of our cities have after their chemical treatment with chlorine. This basin method of treating and disposing of waste pickle liquors might be used by two or three plants together, or the system may be used on a smaller scale where the volume of waste pickle liquors is not large enough to warrant the installation of a plant of this size.

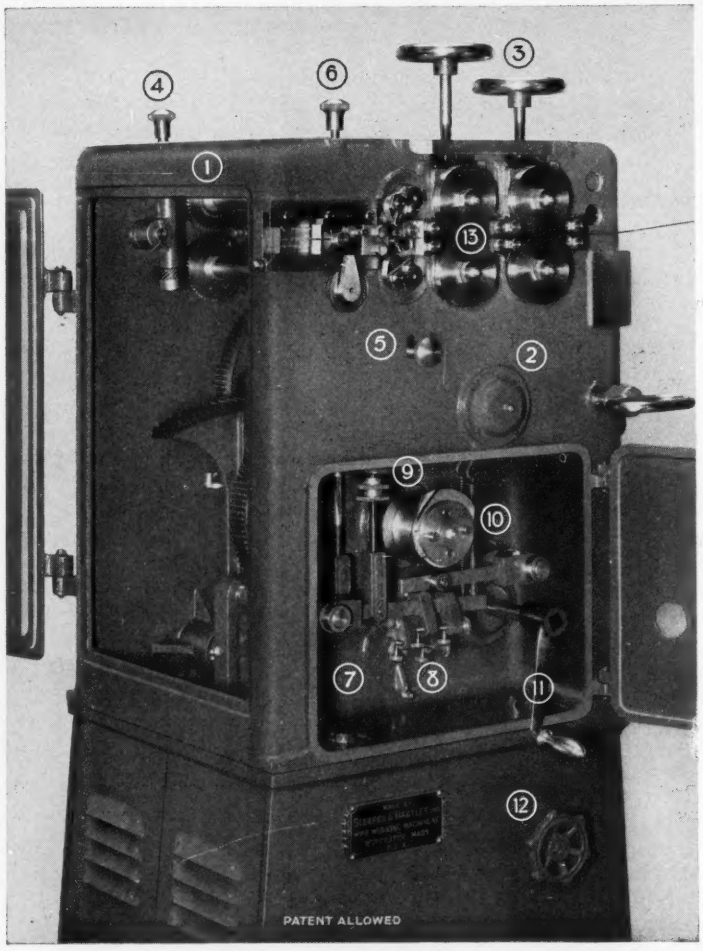
✦ ✦ ✦

IN conclusion, it is the writer's opinion that this method is the simplest method, and the most practical method, yet seen anywhere for the disposal of waste pickle liquors. This method really seems to be the answer to river and stream pollution from war-time pickling operations.

13 Points of Superiority

in

No. 1 Universal Spring Coiler



1- One piece cast iron housing for rigidity and perfect alignment.

2- Ball Bearing construction throughout on all rotating shafts.

3- **Convenient Controls—** Individual pressure control for each pair feed rolls.

4- Individual simple adjustment for cutter alignment, easily adjusted from upper to lower cutter.

5- Pitch and

6- Diameter control readily accessible.

7- Pitch and Diameter Cam control located in recess in front housing.

8- Rapid and micrometer adjustment of compound blocks facilitates set-up time.

9- Pitch stop conveniently located and quickly adjusted.

10- Combination cam hub for pitch and diameter cams, completely removable from machine.

Both pitch and diameter cams may be shaped and timed on the cam hub for special springs and the entire unit removed from the machine, thus reducing set-up time. Additional cams and hubs can be applied for this purpose.

One piece solid cams can be used on this removable cam hub.

11- Removable ratchet-type crank for set-up purposes only. Removed during operation.

12- Motor or Pulley Drive as required with variable Speed Transmission for production range if desired.

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Wire Range .018" to .080"

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Worcester, Massachusetts, U. S. A.

Metal Working In Powder Metallurgy

By Claus G. Goetzel,

Works Manager, American Electro Metal Corporation, Yonkers, New York.

Published in Three Parts:

Part I—June, 1943, Plastic Deformation and Powdered Metals.

Part III—August, 1943, Cold and Hot Working Experiments With Sintered Iron and Copper.

PART II

Industrial Practices in the Sintered Refractory Metal Field

COOLIDGE'S discovery, shortly after the beginning of the present century, that tungsten can be hot worked within a definite temperature range and retain ductility at room temperature, is the foundation of modern tungsten manufacture: Pressing of metal powder in compacts, sintering at temperatures near the melting point, swaging and drawing. As yet no satisfactory method has been found for producing high melting metals by existing practices of fusion and casting. In addition to the lack of appropriate equipment, the product would be unsuitable for further working due to extreme brittleness of coarse crystallite materials.

+ + +

TODAY the important refractory metals are tungsten, molybdenum and tantalum; the first two are the only ones produced in appreciable quantity. Tungsten and tantalum have similar atomic weights and densities. Molybdenum has only approximately half the density of tungsten but almost as much strength. Tungsten, with the highest melting point of any metal, is the strongest known. In addition, tungsten has the lowest vapor pressure at any given temperature and a very high hot strength; these qualities lead to its supremacy as lamp filament material. However, as the hardest of the three refractory materials, it is the most difficult to form and machine; molybdenum is nearly as difficult and tantalum is rather ductile and easily workable. Molybdenum has a vapor pressure considerably higher than that of tungsten. The vapor pressure of tantalum is intermediate, but it has the highest resistivity and linear coefficient of expansion.

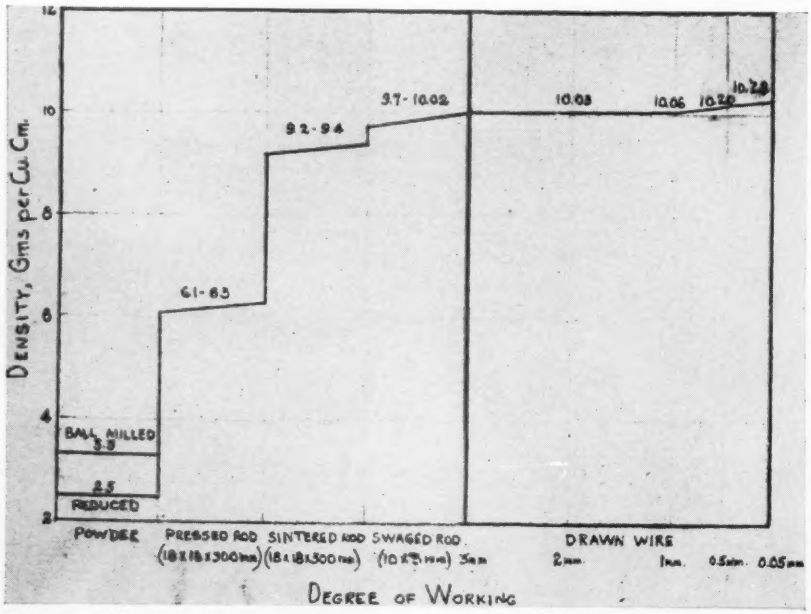

Fig. 4. Density of Molybdenum vs. Degree of Working.

THE chief sources of tungsten ores, as iron and manganese tungstates (wolframites), are China and Australia. Received as concentrates, about 70% tungstic oxide, they are processed by pulverizing, caustic alkali treatment, repeated recrystallization of the alkali tungstate, precipitation of tungstic with hydrochloric acid, filtration, dehydration, and pulverization of metallic powder. It is essential to have close control of purity, particle size and size distribution. Then bar-shaped compacts approximately 2 feet long by 1 inch square, are pressed and sintered in two stages; the preliminary heating in hydrogen at about 2200°F. gives enough strength to the fragile bars to allow further treatment; the high sintering in hydrogen is carried out in water-cooled vertical furnaces wherein, suspended between electrode clamps they are electrically heated by their own resistance up to a temperature close to the melting point.

+ + +

THE bars are worked down into wires and filaments by many tedious operations. Hot swaging by hand and in machines down to about 0.080" wires gives sufficient ductility to allow hot drawing

through alloy cemented carbide and, finally, diamond dies; operations are frequently interrupted for intermediate annealing in hydrogen above 1800°F. In sheet manufacture, the methods are modified, forging replaces swaging and final hot rolling substitutes for hot drawing.

✦ ✦ ✦

PURE tungsten is marketed in several forms, ranging from powder to special pieces, such as discs, target contacts, etc. In the manufacture of tungsten filaments for incandescent lamps, a close control of grain structure is essential to prevent sagging, usually prevented by the addition of thoria and silica.

✦ ✦ ✦

MOLYBDENUM, having many similar characteristics, is considered as a present-day substitute for tungsten in a number of applications; it is especially valuable for use in the X-Ray and electronic industries. In the worked condition molybdenum, as compared with tungsten, has a higher vapor pressure and lower melting point, strength and hardness, but also has high strength and elongation after recrystallization, relatively high conductivity, low coefficient of expansion, high purity and excellent formability.

✦ ✦ ✦

VERY similar to the production of tungsten is that of molybdenum, with the advantage of practically unlimited quantities of high-purity ore available in the United States. The metal is manufactured from molybdenum sulfide recovered from these ores or, in some cases, commercially pure ammonium molybdate. Commercially pure molybdenum, again like tungsten, is available in many classes ranging from powder to special forms—discs, rings, boats, etc.

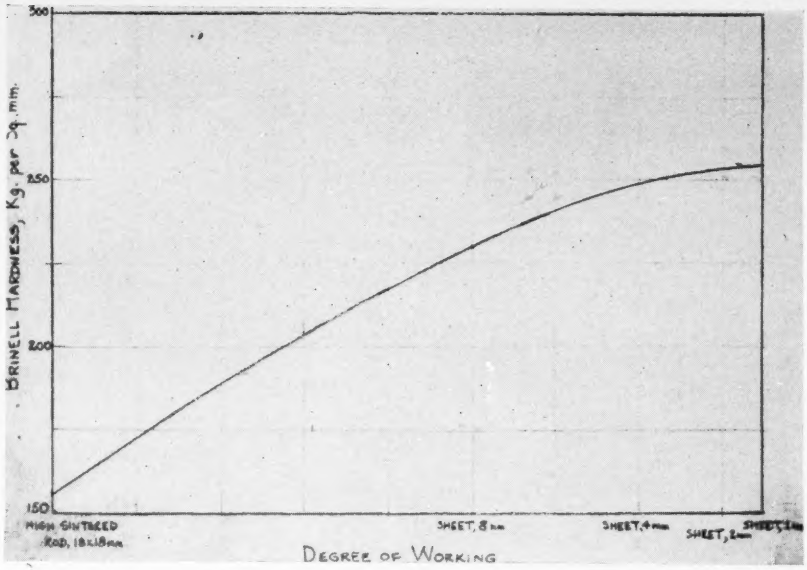

Fig. 5. Brinell Hardness of Molybdenum vs. Degree of Working.

✦ ✦ ✦

SURPASSING tungsten and molybdenum in workability, ductility, and weldability, and maintaining its ductility in vacuum at elevated temperatures while absorbing and retaining gases, makes tantalum most valuable in the electronic industry; these qualities coupled with low vapor pressure and thermal expansion make it very suitable for grids on power tubes. Tantalum is extremely resistant to chemical attack and its metallic characteristics of high strength, ductility and heat conductivity permit the manufacture in combination with plastics or ceramics of useful chemical apparatus.

✦ ✦ ✦

TANTALUM powder manufacture is very like that of tungsten and molybdenum but for the fact that sintering and subsequent annealings must be carried out in high vacuum, and that hot-working is impossible. High-grade tantalum ores are rare: principal production centers are in Australia and Africa. In addition to iron and manganese the ores contain always columbium which must be separated by chemical treatment yielding a purified tantalum salt as base material for the metal powder.

✦ ✦ ✦

TANTALUM, like the other refractory metals, is readily oxidizable in air at red heat or over. Because large quantities of hydrogen are absorbed during cooling from red heat, it must be cold worked and thus is brittle.

✦ ✦ ✦

THE effects of the metal working on some physical properties of the sintered refractory metals is shown in Figs. 4 and 5. Figure 4 shows the density of molybdenum powder after the different processing steps. The apparent density of reduced molybdenum powder is 2.5 grams per cubic centimeter, or approximately 24 per cent of the theoretical density of molybdenum. Conventional compression of the powder at 30 tons per square inch brings the density up to 6.1—6.3 or 61 per cent.

✦ ✦ ✦

SHRINKAGE during resistance sintering of the bar-shaped compact at a temperature approximately 10 per cent below the melting point causes the density to rise to 9.2-9.4 or 90-92 per cent of the ideal density. Bars sintered even as high as 1 per cent below the melting point still shows a porosity of 7 to 8 per cent and are extremely brittle. During the subsequent working, swaging of the bars lifts the density to 9.7-10.02 grams per cubic centimeters

(*Continued on Page 427*)

The Pittsburgh Regional Meeting

THE annual regional meeting of the Wire Association was held this year on May 21st at the Roosevelt Hotel in Pittsburgh.

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A LARGE number of wire men from the Pittsburgh area turned out, although, as is so often the case, men came from considerable distances to be present at the technical session, again evidencing the value of and interest in these in-between get-togethers.

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OUR guest speaker was **Dr. Charles Copeland Smith**, dean of the speakers of the National Association of Manufacturers, who gave us an inspiring address entitled "A Creed for America," in which he pointed out the amazing achievements of American industry in converting to war production, and the attitude of mind of our cosmopolitan American citizenry, that made this possible.

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FOLLOWING the technical meeting, two motion pictures from the War Department were shown, one of which, "Attack Signal," gave an excellent portrayal of many end-uses of wire in war, and emphasized the relation of accuracy of workmanship to the safety of our men on the front lines.

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THE speaker at the technical session was **Edgar Highley**, superintendent of the wire mill at the Dunkirk plant of the Allegheny Ludlum Steel Corporation.

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MR. HIGHLEY bears one of the oldest names associated with wire drawing in this or any other country. His father, the late **Nehemiah Highley**, began his career at the age of three, by riding out with his grandfather on pack ponies to buy fuel from the charcoal burners of the Welsh forests, for annealing wire at the old Tintern Abbey plant. A remote ancestor, probably a "Heilig," was one of a small group of Saxons brought over into England by Queen Elizabeth about 1580, to introduce wire manufacture in the west of England. The elder Mr. Highley's story has already been told in these columns.

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MR. EDGAR HIGHLEY learned the trade of die maker at Jones & Laughlin's mill, in 1898. As most of us recall, a wire man in those days made his own dies and tools, and in fact often cleaned and prepared his own wire. During the first World War he was in charge of die making at the Hazelwood plant, where Jones & Laughlin draw bars and heavy coiled sections.

DR. CHARLES COPELAND SMITH

An Englishman by birth and naturalized as an American citizen in 1919, Dr. Smith in the last war was appointed by the Hague Convention as an Industrial Supervisor for Internment Camps and organized employment for prisoners of war. For many years he wrote a daily column on social subjects for the Chicago "Daily News" and has been active as a sociologist, economist, author, radio commentator and lecturer.

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IN 1918 Mr. Highley joined the Atlas Steel Co. at Dunkirk, and has continued with its successors the Ludlum Steel Co. and then the Allegheny Ludlum Steel Corporation.

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MR. HIGHLEY traced the gradual transition in the wire mill, from low carbon to high carbon steel, to tool steels, to high speed steels, to valve stem grades, and finally the stainless steels.

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THE ensuing discussion dealt with all phases of stainless wire production, centering around fine sizes of stainless rope wire. Various cleaning techniques were discussed, especially those involving the use of caustic and other fused salt baths, with and without impressed electric current; also drafting practices and the employment of various coatings, mainly oxidation and decomposition products comparable to the familiar sull coat. The enormous role of carbide dies in the successful production of these special alloy wires was duly stressed.

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THE Association and those who attended owe **Mr. A. R. Zapp**, manager of the Firthaloy Division of the Firth-Sterling Steel Company, a vote of thanks for his efforts in arranging the details of the meeting. Mr. Zapp presided, and was fortunate in securing the good offices of **Dr. S. A. Braley**, Chief Metallurgical Field Engineer of the Pittsburgh Steel Company, to conduct the technical discussion which followed Mr. Highley's talk.

The Drawing of Zinc-Coated Wire

— A DISCUSSION —

The following are the minutes of the discussion which took place at the technical session of the Worcester Regional Meeting of the Wire Association, on April 30th, 1943, the subject for discussion being "The Drawing of Zinc Coated Wire." ✦ ✦ ✦ ✦ ✦

A Regional Meeting of The Wire Association convened in the Crystal Room of the Hotel Bancroft, Worcester, Mass., on Friday evening, April 30, 1943, at ten-fifteen o'clock, **Mr. Carl Johnson** presiding.

Chairman Johnson: Gentlemen, I know it is kind of tough, after what we have already heard tonight, to get down to brass tacks, but we do have a job to do tonight.

The subject for the technical session, as you all know, is drawing zinc-coated wire. That is a problem that many of us are confronted with today, and is one of the big problems that I believe most of us would like to know more about.

There is just one point I would like to make, and that is this: that while the minutes of the discussion are being taken, no names will be mentioned in the record, so have no fear of your name cropping up in any publications. We are here to learn what we can about zinc-coated wire or the drawing of zinc-coated wire, so let's all enter into the discussion. What you say will be off the record.

To open the discussion, I want to present to you a man whom you all know. He's not away from home, so I can't call him an expert, but he's our dear old friend, **Ken Lewis!** (Applause)

Mr. Kenneth Lewis: This is a hell of a spot to put a consulting engineer in, because you know, probably, a consulting engineer doesn't ordinarily start anything; he just finishes things. I will tell you how a consulting engineer works, since it is just between us. A consulting engineer goes into a plant on one of these mysterious problems; something has gone wrong and things don't come through the way they used to. Everything has been tried and everybody is upset. He goes in there and he listens to the story and he calls them all in, and after everybody who is associated with the difficulty in any way has been seated around a big round table, one by one he calls on them to explain how they see the trouble, how it looks to them and what they think is the remedy. After every man has had his say, the consulting engineer picks out the theory that sounds most plausible and announces it as his own. Then he lays out a series of experiments to test out that theory, and he puts the experiments in charge of the fellow who originally propounded that theory, because then he knows that it will work.

Then he pulls out his watch and looks at it and looks at the time table and says that he just has time to catch a train for Washington and he will be back as soon as he can. What he really does is to hole up in his hotel room and have his meals sent in until news comes to him that the problem has worked itself out. Then he goes back to the plant to take the salute and collect his fee. (Laughter) That is what a consulting engineer does. He never initiates anything at all, so perhaps I am doing something unethical here. It is against all the finest traditions of the consulting engineering profession. I see **George Hartley** is here. I hope he doesn't report me to the union. (Laughter)

The reason why I am not afraid to tell you fellows how it works is because you all know me and probably won't believe a word I say, anyhow. Of course, it's not quite so simple as it sounds; there is one little detail, you must be careful to back the right theory.

This business of drawing galvanized wire probably started a long, long time ago. I don't know when it started. I remember that we used to redraw tinned wire forty years ago, mattress wire, when it came back rejected. It would be discolored and have pin holes and rust spots, and we would just toss it into the liquor and run it down through into the next size to butter over the pin holes and brighten up the color. I suppose back in those days there was some drawing of galvanized wire; in fact, I vaguely remember seeing some of it done.

That was all hot galvanized wire, of course, because that was about all we had, and a hell of a job it was. The difficulties are mainly two: it is not that zinc isn't a nice drawing medium, because it is a beauty, like any other white metal, but it has two weaknesses. One is that the wire has that rather thick bonding layer, that iron-zinc alloy layer between the two metals, which is pretty brittle; and another and perhaps a worse one is that it has oxide on the surface, not only because it has come out of the hot zinc and immediately oxidized in the air, but because the surface of the melted zinc is covered with oxide, no matter what you do to it, and the wire will pick up bits of it. You may not be able to see it, you may not be able to feel it, but the die will find it—and, oh, how it will find it!

The drawing of galvanized wire got a beautiful boost, of course, when electro-galvanizing came in, particularly bethanizing. Those two difficulties were immediately overcome. There is no bonding layer in bethanized wire. Is **Louis Winkler** around? Do I have to be careful what I say?

Chairman Johnson: He's in the back there.

Mr. Lewis: Well, keep your mouth shut for a few moments, Louis. There is no bond between the zinc and the steel. If Louis weren't here, I would probably dwell on that as a disadvantage, but I just pass it over. The zinc is pure all the way from the base metal right to the outside, and it is not oxidized. There has been a lot of drawing of this bethanized wire, and quite successfully.

There is still another kind of galvanized wire that is being drawn, and that is—well, there are probably several kinds, several new processes. The only one I really know is the one that **Joe Herman** developed a few years ago out in Peoria. Joe is the man who was originally responsible for galvannealing, and now he has this new baby. It is a hot galvanizing process. There is an extremely short immersion so the wire doesn't really come up to the temperature of the zinc. The wire comes up vertically out of the zinc, not into the air, but into a steel box, a gas-tight box, and it comes up through a spouting fountain of zinc from the bottom of the pan, runs up vertically as the melted zinc drains back off it— it is not wiped in any way—and finally comes out of this gas-tight box into the air where, just before it gets into the air, it is chilled by a jet of water. This all sounds very complicated but it is really rather simple in practice.

The resulting wire is a sort of a cross between the old-fashioned hot galvanized wire and bethanized, in that while it has a bond, a bonding layer, the bonding layer is extremely thin. The contact has been very brief, and the wire has not come up to the zinc temperature. The bonding layer is so extremely thin that it is flexible enough to be drawn, and, furthermore, the zinc on the outside has never been exposed to the air until after it has been chilled. That wire also draws very nicely.

I have a number of reports on it—and by the way, perhaps I ought to say, just as if you didn't know, that I don't know anything about this subject myself, but I have been watching the New Deal very carefully and I have learned how they handle things that they don't know anything about. A man put in charge of a division down in Washington is always chosen for his ignorance of the subject, and the first thing he does is to send out questionnaires so that the trade and the industry in general can educate him. Therefore, when I learned that I had to stand here tonight, I sent out some questionnaires, and I thought the only practical way to start this discussion was for me, first, to tell what little I knew or suspected or had learned from my questionnaires, and to let you embroider it from the floor. You can denounce it or deny it or agree with it or anything you please.

One thing that everybody seems to

have agreed on is that the die shape is rather fussy, rather important, and in checking over these opinions. I find that the most important thing is to round off carefully all the junction points in the dies between the various cones and between the cone and the bearing and between the bearing and the back relief. One man stresses the junction between the bearing and the back relief as being the most important point. It seems a little thing, but sometimes it is the little things that make the difference between success and failure, between the merely good man and the real genius.

As I was thinking that over today, I thought of the story of the two quarter-wits that were digging a grave. They got it all done and scraped down and banked up at the sides, and then one of them went into the office and came out with a chair and put it down in the grave. The other fellow said, "What's that for?"

"Why," the first one said, "that's for rigor mortis to set in!" (Laughter)

A small point, but as I say, sometimes these little points make all the difference between success and failure.

Here is a man who says that low-grade spelter should not be used; no spelter containing large amounts of lead and cadmium. It is highly desirable to keep the lead and the cadmium as near high-grade specifications as possible.

On the other hand, I have heard from another source that it is not at all important to have a high-grade zinc as far as drawing is concerned. You should keep away from the very lowest, everybody seems to be agreed that Prime Western is rather a failure, but I have opinions that endorse everything above Prime Western. Of course, the question doesn't arise in the case of bethanized or any electro-galvanized wire.

Here is a man who says that he is drawing not only wet but also dry. He takes it down in some cases low carbon wire, from .062 to .009 quite successfully, all the way, wet, and sometimes he draws dry down to .31 and goes the rest of the way on a wet machine. He has found that very satisfactory. "We have drawn both the hot galvanized and electro-galvanized wire with equal satisfaction, and the processes are exactly the same." When he says "hot galvanized," in this particular plant, they are drawing this hot galvanized wire of Joe Herman's that I have described.

"In dry drawing practice, we reduce at a rate of 30 per cent per draft, finishing speed 600 feet a minute. The most effective lubricant for dry drawing is a mixture of fairly high titer soap and calcium stearate, three parts of soap to one of stearate. The use of low titer soap causes filling of the dies and peeling of the coating.

A 14° approach angle, 50 per cent bearing length; remove the sharp edge from the exit of the die into the back relief. On wet drawing, 22½ per cent reductions, finishing speed from 1250 up to 2000 feet; 14° approach and 50 per cent bearing length. We found it desirable to blend the approach angle into the bearing on a Pohenkra or diamond swing-action machine This tends to reduce the bearing length somewhat and results in a tapered bearing. (That wouldn't be a reversed taper, would it?) It does, however, reduce the pull through the die and relieves the tendency to suck down. The slippage should be held at a minimum in wet drawing operations. Keep the draw heads eight inches in diameter or over.

The wet lubricant we have found most successful has been a potash saponified soap containing some free fats or oils. Soda saponified soaps have resulted in more or less filling of the dies and peeling of the coating.

Summing up, I would say that the most important factors are the die shape and the percentage reduction. Our experience with the use of a slightly tapered bearing indicates that this is an important factor to watch. It is well to remember that when recutting such dies to the next size, they should be recut to an exact angle and not polished to the next size on the Pohenkra machine alone."

Now, here is a die man speaking. He says, "First, it is important to have a blend between the bearing and the approach angle; second, we have found it important to use shorter bearings. I would suggest a bearing length approximately 25 per cent of the diameter of the wire." Now listen to another report. "There is no difficulty in drawing galvanized wire." That ain't the way I heard it! (Laughter) "I am doing it every day. Dies last much longer drawing galvanized wire than they do drawing regular stock. Drawing about 32 gauge, 80 carbon, have had dies last six days at a speed of a thousand feet a minute. The trick, if there is one, is to use the proper lubrication. We dip in a solution, of which the trade name is Gilron, made by somebody in Chicago—I will get the address for you." Well, this man who says that there is no trouble whatever is Joe Herman himself, drawing his own wire. (Laughter)

However, he is right, because there are men right in this room who are buying Joe Herman's galvanized wire and drawing it down to .009 and doing very nicely, and they tell me that as between that wire and the electro-galvanized, there is no difference.

I have heard quite recently from people who are drawing ordinary hot galvanized wire, the old-fashioned stuff with the broad alloy band and with, necessarily, some oxide on the surface; while a few weeks ago, the report I got was that it was terrible, I heard just tonight that it was running very nicely and came up to a yield of 90 or 95 per cent or thereabouts. So you hear all kinds of stories.

I gather from summing up everything that I have read and heard and brought in on these questionnaires that the dies are rather important, particularly the shape of the die. You want a rather small angle, you want to be very careful to round off all the junction points between cones and bearings; that lubricant is rather important, but no two people agree on which is the one. There are some lubricant men here tonight who may or may not have something to say about that. One of them particularly, I asked if he would say something and he said, "No, I came to learn something."

That practically exhausts what I can say about drawing galvanized wire. No, there is one other thing, probably of no practical importance whatsoever, but some years ago, when I was engaged in a wild bout of experimental work, I ran into something which I had never heard of before and never heard of since, and I didn't take time to run through it.

I was annealing steel wire on spools, dry drawn wire. I had it on big spools which I was annealing in oil barrels. I would pile spools up one on top of another so the weight would hold the flanges from warping and put an oil barrel down over them, dipping into a saucer of sand, and got a pretty good bright job, because there wasn't much air space left in there, and then I would run the wire off the spools on to a take-up block so I could get loose bundles to copper for drawing down into fine wire. I was taking six or seven drafts.

I ran into one lot that just wouldn't take the copper. I had a tin-copper solution, mostly copper with a little bit of tin. I couldn't get a trace of copper on that wire. I checked back and I found that these steel spools that I had been using were come-apart spools, collapsible, and they had a sheet steel barrel, and the barrel of one of those spools had been made out of galvanized sheet instead of plain. The zinc had vaporized and had gone all through that potfull of spooled wire and had given me some sort of a zinc penetration on the surface which absolutely would not take any copper.

Having arrived at that point, I said, "The hell with it! Throw it in the tub and draw it." I threw it in the tub and drew it without a trace of copper on, and it drew just as nicely as any copper-coated wire I ever saw. There was a sort of what you might call a sherardized job, I guess. It just confirmed me in the suspicion that under the right conditions, there is no better drawing coat for steel wire than a nice coat of zinc.

Now I think the time has come for us to get some opinions from the floor. I know there are at least eight or ten in the room here who have had some experience with drawing galvanized wire, and many of them have had a lot of it. A good deal of it is being drawn now, I think, on these Army specifications. Louis Winkler, you sit back there. A lot of your bethanized wire has been sold for redrawing. You have probably heard a lot of troubles and heard a lot of triumphs. Can you detail a few of them to us?

Mr. Winkler: Ken, I'll be honest with you. I have never heard of any trouble with our wire. (Laughter)

Mr. Lewis: Just what I expected of you. Well, let me put it this way—

Mr. Winkler: Well, maybe we had better ask the boys who have been drawing it. I think probably they might be able to tell you the troubles which they have been too considerate to tell me.

Mr. Lewis: Let me put it this way. I know you wouldn't admit any troubles, any actual troubles, but sitting where you sit in the industry, if there were to be any troubles, where would you expect to find them?

Mr. Winkler: In the wire mill. (Laughter)

Mr. Lewis: Yes, in the wire mill. And how would you expect to get around them?

Mr. Winkler: Well, the facts that you

read from the replies to your questionnaire check pretty well with our impressions on the drawing of zinc-coated wire; that is, the die contour, first, and good lubrication.

There is only one thing that I didn't hear mentioned, and that is, I think it is quite important to watch that you don't develop too much skin temperature. Some people, when they start out, have had difficulties just as in any other kind of a job, but they have always been able to overcome them finally, and I don't claim that it is very much of a problem any more. I agree with the idea of a short bearing and I think perhaps that may be in a measure connected with this question of surface skin temperature; at least, that was one of the early things that we believed we found to be important several years ago, and especially in drawing high carbon wire, where one would naturally expect to run into more difficulties than you would in drawing low carbon wire, simply because the actual work of drawing creates more temperature

I honestly don't know what else to add. Of course, as you probably know, the only material of that kind that I have been connected with has been pretty damn good. (Laughter)

Mr. Lewis: Do you want that in the record? Louis, you say you think that what I have said about the die is about right. Do you mean that I was right in saying the die shape was important, or do you mean that the die shape that I described as about what your idea is—

Mr. Winkler: Well, except that one report on the questionnaire gave a 50 per cent of the diameter as the bearing length. We started out with that and found it desirable to shorten it. I don't believe it should be much more than a quarter of the diameter bearing length, and it is important to round off the approach there, the junction between the cone and the bearing.

Mr. Lewis: And you think 14° is about right?

Mr. Winkler: Well, of course, that depends upon the size of the wire. I believe in fine wire, I think I would prefer something like 12°.

Mr. Lewis: You mean in wet drawing?

Mr. Winkler: Yes.

Mr. Lewis: Well, it seems logical that in wet drawing, where the reductions are bound to be smaller, a smaller angle would be desirable. Certainly, it sounds plausible.

Mr. ————, what has been your experience? What do you think about that? Have you found any difference between dry and wet drawing in the dies?

Member: I might say on that wet drawing die you spoke about finishing that die with the Pohenkra machine, that practically does what Mr. Winkler described here. It tends to broaden the angle and blend that approach into the angle, meaning, when the work is actually done, you are drawing in a shorter bearing and a little tighter end. It really assumes more of the shape of a diamond die than it does the regular shaped die.

Mr. Lewis: That really shortens your bearing somewhat.

Member: That's right, it shortens the bearing. It tends to tighten the approach angle. That is more important on the wet drawing than in the dry drawing, in our experience.

Mr. Lewis: You use practically the same die shape in the wet and dry drawing, then?

Member: Well, we haven't found that quite so necessary in the dry drawing as we do on the wet.

Mr. Lewis: Have you got any bright ideas about lubricants?

Member: No.

Mr. Lewis: Is Mr. ———— here? (Not present) He has quite a lot of experience with this. Mr. ————, are you here?

Member: Yes, Ken, but I haven't anything to report. We have done very little along that line, had very little experience. We draw some dry bright for a special job, but as far as the wet drawing is concerned, we haven't really gone into it. I think this discussion has developed something along the lines of a story that my dad used to tell, about two old farmers, neither one of whom could read or write or tell the time. One of them was very proud one day to get a watch. The other fellow said, "Hey, Ike, what time is it?" Ike took out his watch and looked at it and said, "Thar she is!" The other fellow looked at it and said, "Durned if she aint!" (Laughter)

That is about the way this drawing of wire looks to me. What is the drawing of wire? It is pulling wire through a die, with a lubricant, at a certain speed. If your dies are right and your lubricant is right and your speed is right, that's the whole answer. (Laughter)

Mr. Lewis: And your wire is right.

Member Well, that is always right in the wire business. I am sorry, but I haven't any first-hand information to give you on the drawing of galvanized wire. I think it is a thing that is coming, or is already here. Probably with the scarcity of tin, which may continue for a long time, it may find more and more place.

One question I would like to ask, personally, of anyone who could help us on the subject, is this: You speak of the lubricant. With the type of wire we are drawing, we don't want any lubricant on after it is drawn, because it doesn't help very much in the forming in an automatic machine. Now, there is a problem for you. I would like to know how to draw it without a lubricant. If there must be lubricant on it, I would like to know what is the lubricant that will give the least trouble in an operation on an automatic machine, as a coating on the wire. Now, if you find anybody who can answer that, it would be some help.

Mr. Lewis: Who has the answer? (No answer.) Perhaps it is appropriate that I should be stuck up here on this job, because I now remember this drawing of galvanized wire may be one of my illegitimate children. Just after the last war, when Frank Bullock of the Army, then Captain, was looking into the matter of signal wire for the Signal Corps, he spent a good deal of time up in this neighborhood and he came quite often to see me. He was new in the wire business and he had had this job wished on him, of getting this tinned high tensile and copper strand combination that they were using for communication wire.

He told me some of his troubles. The tinned wire was what they had been using, that was what the specifications called for, they liked it, but the wanted to put a lot of it in stock. Looking ahead to the next war (which was the one we are in now), and he said the plants of the country couldn't possibly keep up with the requirements in time of war, and the only solution he saw was to store a lot of it. He found out that there was only one way to store it, and that was to store it in metal gas-tight containers, out of which air had been exhausted and a neutral gas had been puffed in. Otherwise, the tin coat always had pin holes in it, and in the course of time, they developed little rust spots, and when the next war came, the wire would be all ruined.

I suggested that he switch to galvanized wire. Well, he said it would take twenty years to get the specifications rewritten by the Government and, furthermore, he had been told that with high tensile wire, if it were galvanized, the heat of the spelter would spoil its properties. Sometime during the course of our discussions, a brain wave came to me and I said, "Why don't you get this wire galvanized at the last patenting point and then have it drawn down with the zinc on it?" and he said he would get to work on that and see if anything developed out of it. That was in about 1921 or 1922. Was that about when this business started? I might have sown the seeds of this thing myself. Now I am reaping the whirlwind.

Is Mr. ———— here from Canada? (Not present) Is Mr. ———— here? I won't mention your company because it is probably a military secret, but let me explain that he is no relative of mine. He is one of the working Lewises. (Laughter).

Member: I might say that your name and mine are not very popular tonight, so perhaps we had better not dwell on that. (Laughter)

Mr. Lewis: You people have had some experience, have you not, Mr. ————?

Member: We have had some experience, but I don't know that I have very much to contribute. I would like to ask a couple of questions, because we still have our problems to solve. I would like to know whether, in dry drawing of zinc-coated wire, it is common to use lime coating as an assistance to lubrication? We have done it both ways, and we are not quite sure about the best way of doing it.

Another problem, of course, in dry drawing zinc-coated wire is that it won't climb up the block if you use the same blocks as you use for steel, and that is an awful nuisance because you have to alter the angle of the blocks. There may be some way of avoiding that, and if there is, I would be very glad to know it. I would like to ask those two questions, if I may.

Mr. Lewis: One, whether or not lime is used, whether it is better to use lime, and how do you make the wire climb up the block without changing the taper; right?

Member: That's it, yes.

Mr. Lewis: Who has the answers?

Member: I can give him one of the answers. The water-cooled blocks keep down the surface heat, as Mr. Winkler has mentioned, and will permit the proper climbing of the wire up the block.

Mr. Lewis: What is the trouble, Mr. ———? Won't it climb or does it climb too fast?

Member: No, it won't climb. You usually have to change the angle of the block.

Member: The cooler blocks will help that.

Mr. Lewis: A cool block, then, will work for either zinc-coated or plain wire, equally well?

Member: Yes.

Mr. Lewis: Mr. ———, did you find that? Have you had any difficulty with your dry drawn galvanized wire climbing the block?

Member: Not so long as you have a good smooth block.

Mr. Lewis: You mean that you have to have a smoother block for galvanized than you can stand for ordinary wire?

Member: Yes.

Mr. Lewis: And does it make any difference whether or not you have put lime on the wire?

Member: I never tried lime so I don't know.

Mr. Lewis: Well, the dry drawing that you do of galvanized wire is continuous drawing, isn't it?

Member: That's right.

Mr. Lewis: So your only block problem would be on the fiinishing block. Is that what you are thinking, or are you thinking of draft after draft, single hole?

Member: Well the problem is worse on the finishing block, although you do have some trouble on continuous machines, sometimes.

Member: I think that if you use ordinary laundry soap you will find very good results as far as the block is concerned. We find that we can use it in both dry wire and also liquid wire.

Mr. Lewis: You say, use ordinary laundry soap?

Member: That's right.

Mr. Lewis: Do you mean use that as a drawing lubricant?

Member: No, use it as a lubricant beyond the die. You put that right on the wire, and you will find it will climb very easily.

Mr. Lewis: You put it on after it has passed through the die?

Member: That's right.

Mr. Lewis: Just grease it up with laundry soap after it has passed the finishing die?

Member: That's right.

Member: If you dip the wire in lime, it will pick up soap enough to form a film and climb on the block just the same as any bright drawn wire.

Mr. Lewis: That was my impression.

Member: That's true.

Mr. Lewis: Mr. ———, have you had that trouble with wire that was not limed or wire that was limed?

Member: I think we had trouble with both procedures.

Mr. Lewis: Mr. ———, do you find any particular advantage to a lime coating? I take it from the way you speak that you lime-coat it all.

Member: No, we don't. Some sizes are lime-drawn. If you lime-coat it, the soap forms a film on there that gives a smooth, slippery surface, and it will climb in dry drawing as well as any other.

Mr. Lewis: You think it will take on the same sort of surface that ordinary lime coated wire will?

Member: I don't think; I know it will.

Mr. Lewis: Well, in the little experience that I had, I have found that to be so. I would lime the stuff just as though it were ungalvanized wire, draw it through ordinary soap, and it took on the same kind of a hard, slippery film. It went up the block very nicely.

I also did find that it would run through and pick up soap without any lime on it and pick it up pretty well. I don't remember whether there was any difficulty in climbing the block.

Member: The only purpose of lime is to enable it to pick up more soap, so it forms a film on there. The minute you have that film on there, your zinc doesn't contact the block and the heat doesn't enter in it so much.

Member: My experience, as a manufacturer of lubricants, is that that sounds very well, but as far as the coating on electro-galvanized wire is concerned, what lubricants you use after you have your coating on it are damn unimportant. That's a hell of a thing for a lubricant man to say, isn't it? I mean that it is not particularly important which lubricant you use. One is as good as another. You have got to have enough coating.

Mr. Lewis: You mean, if you have enough zinc?

Member: No, not the zinc, but the coating you put on over your zinc. That is important. There are two important things to galvanizing. One is your die, and whether you have no bearing or an average bearing is hard to say when you get down to .009 and so on. The average die manufacturer can't say.

Member: You are talking about wet drawing and we are speaking about dry drawing.

Member: By putting on more soap, you put on more lubricant. When you put lime on there, you make lime soap, and when you wet it, all your wet solution washes off. You talk about your soda saponified or other soft soaps with lubricant. They are all washed off in the washing action unless you get an insoluble coating on there. They will wash off in four or five holes, they are not going to carry through, and the result is that there is nothing on the die when you finish. But the actual soap content, what it is or what kind it is, is not awfully important. One may be a little better than another and you may get a little better result but the really important thing is the coating that you get on the first draft. The best results I have seen have been in a mill where they don't have much trouble with the wet drawing because the wire is first drawn three holes dry. I know another mill that is drawing 80 carbon hot galvanized, five holes dry, and then taking the wet machine and drawing 2000 feet a minute. The secret of that is in the damn coating they are putting on, not the soap they have in there or the wet lubricant. It is the coating you have over the metal. The soap in there won't wash off.

Mr. Lewis: You had me puzzled for a while. I was wondering how you were going to get a coat on before you started your wet drawing. You are talking about wire that is drawn a few drafts dry to give a nice coat?

Member: That's it.

Mr. Lewis: And then the coating lasts right through, over the wet machine?

Member: Coating over your zinc. That, to my mind, together with the question of the die, or the bearing of the die, are most important. I say no bearing. I know that if you have no bearing, you get better results even than if you have 25 per cent bearing. You get down to .009 and the difference between 25 per cent bearing and no bearing is awfully small. It is hard to find it with a toothpick—which we use. (Laughter) But I know one company that will take a photograph of their dies and they can tell whether they have no bearing or 10 per cent bearing, even when they get down as low as .009, and I know that that is a hell of a job, from experience, to try to take a photograph of it. But they can do it.

Just trying to pick it out with a toothpick in the ordinary way, if you have 25 per cent bearing, is a pretty hard job. But we found out that no bearing at all is better than 25, and 25 is better than 50, and 50 is better than a whole bearing. That hasn't anything to do with the lubrication at all.

Mr. Lewis: Well, that is a good deal for a lubricant man to say, and we are very much obliged to you. (Laughter)

Member: I am more than likely to get fired if this has been taken down.

Mr. Lewis: I know a fellow, at a meeting of this sort, when he is asked to hand stuff out to his competitors, feels as though he were being asked to cut his own throat.

A story just popped into my mind, the old story about the old man and his wife who used to quarrel all the time, and one night they actually came to blows. They were pretty old and feeble. The old man had arthritis and the old lady had the shaking palsy, so they couldn't do very much damage. But they were rolling around the floor, pawing each other, and the old lady got on top and slowly worked around until she has her thumbs on his Adam's apple. Just before she began to press, he said, "Maw, reach up on the dresser and hand me down my teeth. I want to bite you." (Laughter)

I am asking some of you fellows to hand me down your false teeth. I want to bite you. Mr. ———, most of the wet drawing of galvanized wire that you have done has been from wire that has come hard from the dry machine, hasn't it?

Member: That's right.

Mr. Lewis: And have you found, too, that it didn't make very much difference what the wet lubricant was, if you had a good coating established already?

Member: Well, we have drawn quite a bit just by wet drawing. I have never found a whole lot of effect from the previous coating.

Mr. Lewis: Would you use the same lubricant that you had been using for coppered wire?

Member: No, not necessarily.

Mr. Lewis: You say "not necessarily." Do you actually have a different lubricant reserved for this galvanized?

Member: Yes.

Mr. Lewis: Is that something you want to give the name of, or don't you care?

Member: It is just a potash saponified soap, that's about all. It is fat-free.

(Please turn to page 416)

Factors In Company Relations

By Whipple Jacobs,
President, Belden Manufacturing Company,
Chicago, Ill.

The author stresses the importance of enlightened employee relationships as well as the insistence of rigid standards of quality. ✦

THE need for industry and business in general to promote good public relations has resulted in constantly growing emphasis on the problem. A great deal of time and effort have been and are being devoted to solutions, and excellent progress has been made. The good effects can be attributed, for the most part, to the efforts of individual companies which, recognizing the need for a more friendly public attitude, have undertaken to carry on programs of enlightenment.

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A FEW of these companies realized many years ago that their managements were really in partnership with the public, and that it was important for the public to have an appreciative and understanding attitude which could be obtained only through comprehensive information. In consequence, appropriate steps were taken to win friendliness and confidence. Many more concerns have since joined in the effort, and today it can be said that people in general have a better understanding of industry than has been the case in the past, for the reason that they are better informed as to industrial contributions to the economic and social welfare of the Nation.

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THIS changing attitude is most gratifying when it is recalled that not all industry—and by industry I mean all classes of business—has been free of errors or has been entirely blameless throughout the years. It is regrettably true that there are recorded instances of errors charged to industry, and it is also true that only a small part of the over-all industrial structure was involved. However, criticism did appear, accompanied or followed by reactions that caused difficulties for those organizations which were beyond criticism as well as for the blameworthy.

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WHEN business and trade associations embarked on campaigns to reverse the attitudes referred to they were only partially successful, for in the main they were in position to speak only impersonally and not particularly. Then, as experience revealed the limitations of this approach, the associations urged upon their members the adoption of programs suited to individual needs and situations.

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WHILE the ensuing publicity produced a salutary effect, attention must be paid to the fact that the broad concept of public relations goes much further than merely wooing the good will of the consuming public. The first step in any such program is to make sure that the policies and practices of an individual concern are right. Upon this sound base can be arranged an effective procedure to enlighten all company relationships ranging from the public to employees, dealers, distributors, suppliers, stockholders, and the community or communities in which the company operates.

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IT is true that business has had much to contend with. It is doubly important, therefore, for business, particularly during periods of economic upheaval, to conduct its affairs in a manner above reproach and to tell its story to the public and to the other segments with which it deals, by means of a frank presentation of facts. This must be a continuing job for, like advertising, results can be obtained only by unceasing reminders. And let me hasten to add that advertising as well as news statements, based on facts, provide the lamp of enlightenment, especially in these times when so much of our production is geared to war goods. The purely institutional advertisement, consequently, is a potent factor in public relations.

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MANAGEMENT is taking cognizance of another important factor in public relations—that of employer-employee relations. Here again a few employers with vision, years ago adopted plans to promote the good will and loyalty of employees by instituting all possible safeguards against foreseeable contingencies such as recessions in business, illness, and old age. Many more have since followed suit, and today virtually all large employers have plans worked out to spread jobs during periods of reduced business. There are provisions for sickness, old-age Retirement Income and Life insurance, with the company sharing the costs. Paid vacations are fairly common. Recreation and sports are encouraged, lunchrooms have been established, and in many cases food is available at cost in company dining rooms; virtually every plant has a safety program to guard workers against accidents. Also, many companies follow the wise policy of informing their employees on all phases of the business.

Reprinted from Executives Service Bulletin, Metropolitan Life Insurance Co., December, 1942.

Joint Responsibility

THE mutual advantage of employer-employee relations programs is obvious, but it has taken a long time for management in general to recognize the need and to act on it. Management and stockholders must share responsibility for any failure to establish employee relations programs. It has sometimes happened that the former concentrated its attention on profits while the latter gave little thought to other than dividends, both lacking the vision to see the relationship between loyal workers and dividends. And there were many who regarded progressive employee relations as smacking of paternalism and pampering.

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MANAGEMENT, in some cases, has been backward in its relations with stockholders. Too often management has assumed that the stockholder — the real owner of the business—is not concerned with the way it is conducted, so long as he receives a dividend.

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IT is estimated that there are 13,000,000 owners of corporation stocks in the United States. In the main the individual ownership is small, perhaps 25 shares. True, their principal interest is in dividends, but it is to the interest of management to enlist the power latent in this great body of influence. Management should set up and follow out a procedure of full and frank information for the stockholders; of making them feel that they are part of the business —which they certainly are; of inviting constructive criticism and suggestions; and, when possible, participation in the annual meetings.

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IT may be a bit presumptuous for me to cite the Belden Manufacturing Company as typical of an ideal and all-inclusive public relations procedure, and I simply offer what we have done thus far as an example of a studied effort to go beyond making profits and paying dividends. We long ago recognized the social responsibilities involved in conducting a business and took steps accordingly. Those steps include all categories mentioned in the foregoing outline.

✦ ✦ ✦

IT was not until 1939 that we were confronted with the problem of stockholder relations. Up to that time our company, now 40 years old, was a closed corporation. The transition to public ownership came in that year, the start of the second generation of the business, and with it my election as president. In acquiring stockholders we knew that we were assuming a new responsibility, so it was determined to do everything possible to encourage their active interest in the company and its affairs. We were convinced then, and that conviction has since been justified by actual experience, that management and stockholders benefit by frank publication of all facts, both favorable and unfavorable.

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Reports Issued Quarterly

OUR interim reports, issued not less frequently than quarterly, contain explicit information in terms easily understandable to the lay mind, and include definite statements on current and future trends and expectations.

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OUR annual reports have been given in comprehensive detail, again in easily grasped form, and have included pictorial treatment of important elements. In addition to the regular earnings statement and balance sheet, which always give complete comparisons with the preceding year, we disclose our current position on commitments, which is an important item not covered by common audit practice. Future commitments are fraught with significance, for if they should be large and made on a declining market, the earnings of a year might be wiped out.

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IN our annual letter to stockholders we furnish an accurate and more complete report on operations, with full disclosure of all pertinent facts permissible under today's conditions.

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WE encourage attendance at our annual meetings, which are held at a time and place as convenient and accessible as can be made. At those meetings our department heads, as well as our officers and board of directors, are available to answer questions relating to the business. Also, a cross-section of our products has been placed on display so that the attending stockholders may examine the various articles we manufacture.

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NEW stockholders are made welcome by personally signed letters inviting their visits and inquiries. With the letters we enclose the imprints of our corporate calendar, the latest annual report, and the latest interim report. This is the first step in our stockholder relations' program and we believe it to be a good one. For one thing, it imparts a human touch; it serves to demonstrate that the corporation is a human organization, operated by human beings, and not an impersonal mechanism only occasionally aware of its stockholders and their interests. The reaction to this treatment has been most gratifying.

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War Bond Plan

IN August of 1942 we initiated another step in stockholder relations by pioneering a plan of paying dividends in War Bonds and Stamps or in cash. I believe that our company was the first organization with a listed stock to offer that option. How well our stockholders responded is evidenced by the fact that 10.6 percent of the total quarterly dividend was accepted in war securities. The cost of operating the plan is modest.

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CORDIAL letters were received from share owners, one of them stating, "I think this is a splendid idea. Please continue to give us this privilege."

(*Please turn to Page 415*)

Synthetic Raw Materials For Wire Insulation

By Dr. A. M. Ross, Jr.,
Bridgeport Works Laboratory, General Electric Company.

Abstracted from an article entitled "Synthetic Flexible Insulations" published in the General Electric Review, April, 1943.

THE synthetic rubbers and resins suited to flexible insulation and commercially available are listed by trade name in Table I. Here they are classified according to gross physical properties (elasticity, flexibility), and grouped according to their chemical type. A material is considered to be highly elastic if a test piece retracts rapidly after being stretched to at least three times its original length. It will be noted that certain resins normally rigid or even brittle may develop high elasticity on being **plasticized** by the incorporation of appropriate nonvolatile liquids which function to reduce intermolecular forces by increasing the average intermolecular distance. Unfortunately this is too frequently accompanied by a readiness to flow at room temperature, which severely limits the usefulness of the resin-plasticizer compound. For this reason, polyvinyl chloride and its very close relatives are the only members of this class which are useful at present for electrical insulation.

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THE resins which are most pliable when plasticized have, at present, somewhat limited use in extruded wire insulation, most of this stimulated by the rubber shortage. Prominent among these are the cellulose esters and ethers (A through D, Group III, Table I). These chemical modifications of the natural cellulose polymer result in the production of workable plastics largely by lowering the fusion point, which, in the starting material, lies above the decomposition temperature. Most of the other materials have highly specialized uses. Saran and nylon have not as yet gained general acceptance in wire insulation techniques. Formvar is mentioned as an example of a resin, flexible in thin films (as on magnet wire), which is customarily applied from a liquid enamel.

TABLE I

Trade Names of Basic Insulation Materials for Wire and Cable Construction

Chemical Type	Trade Name
I. Polymers which show high elasticity in the uncompounded state.	
A. Polychloroprenes	GR-M (Government Rubber) Neoprene CG, E, FR, G, GN, ILS, KN, M.
B. Butadiene-styrene copolymers	GR-S (Government Rubber) Buna S Hycar OS-10, OS-20, OS-30 Chemigum IV Buton S
C. Butadiene-acrylonitrile copolymers	Buna N Perbunan Perbunan Extra Hycar O.R. Chemigum I Thiokol R.D.
D. Butadiene-isobutylene copolymers	GR-I (Government Rubber) Butyl Rubber (B series)
E. Polyisobutylene	Polybutene (B series) or Vistanex Synthetic 100
F. Polysulfides	GR-P (Government Rubber) Thiokol A, B, D, F, FA, M, N
II. Polymers which show high elasticity only when plasticized.	
A. Polyvinyl chloride (plasticized)	Koroseal Vinylite (Q series)
B. Vinyl-chloride vinyl acetate copolymers (plasticized)	Vinylite (V series)
C. Polyvinyl Butyral	Butvar
III. Polymers which are flexible but not highly elastic when plasticized.	
A. Cellulose acetate	Cellulose Acetate Tenite I Lumarith Fibestos
B. Cellulose acetate-butyrate	Tenite II Hercose Kodapak
C. Cellulose acetate-propionate	Hercose AP
D. Ethyl cellulose	Ethyl Cellulose Ethocel
E. Polyamides	Nylon
F. Polyethylene	Polythene Polyethylene
G. Polystyrene	Styron Lustron Loalin Polystyrene
H. Polyvinyl formal	Formvar
I. Polyvinylidene chloride	Saran

Properties of the Insulation Compounds

PROPERTIES of the more important polymers as compounds for flexible insulation applications are summarized in Table II. It will be seen that these conform in a general way to the deductions made previously on the basis of chemical structure. The art of rubber compounding consists in altering the properties of rubbers by appropriate admixture of fillers, plasticizers, stiffeners, softeners, accelerators, antioxidants, extenders, etc. It is manifestly impossible to sum up in a simple table of properties the large body of investigation which has been and is being applied to this art. However, there should be some utility in a brief table of properties to orient the engineer with respect to the many types of synthetic and natural rubbers now available to him. Because a given rubber may vary widely with respect to any one property by appropriate compounding, the attempt is made in this table to give the **optimum** available rating to each property for a rubber. It should be borne in mind that optimum value of one property may exclude optimum value of a second property. For example, Buna S rubbers have fundamentally good electrical properties, but require for maximum tensile strength high carbon loadings which mask the good electrical values completely.

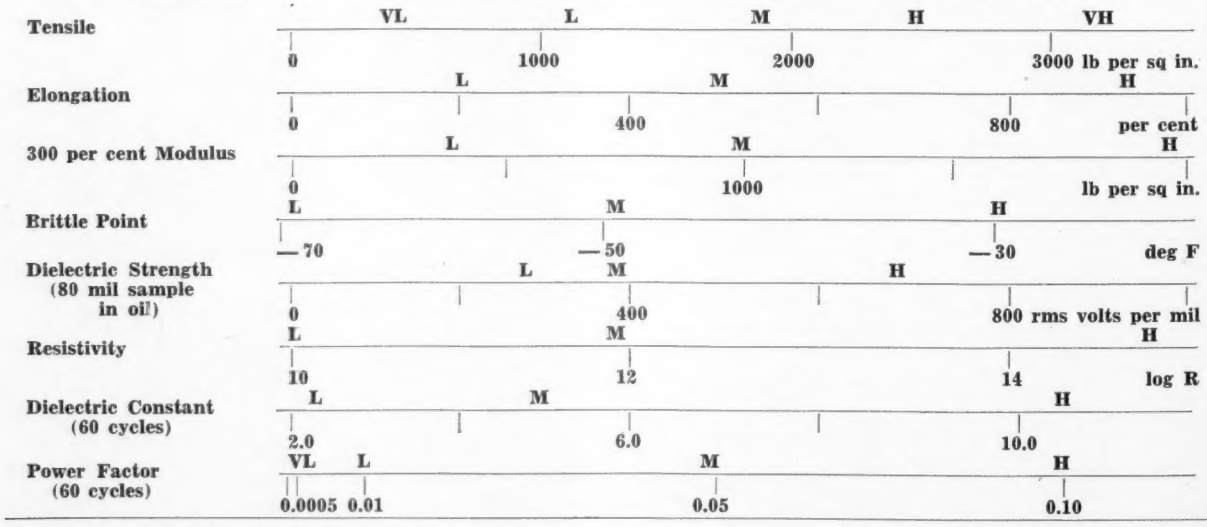
TABLE II
Properties of Insulating Compounds

	Crude Rubber	Reclaimed Rubber	Polychloroprenes	Buna N Types	Buna S Types	Butyl Rubber	Polysulfides	Polybutene	Plasticized Polyvinyl Chloride	Ethyl Cellulose	Cellulose Acetate
A. Processing											
(1) Extruding	G	F	G	F	F	F	F	P	G	G	G
(2) Molding	G	F	G	G	G	G	F	F	F	G	G
(3) Building Tack	G	G	F	F	F	F	P	F	P	P	P
B. Mechanical											
(4) Tensile	VH	L	VH	VH	M	M	M	VL	H	VH	VH
(5) Elongation	H	M	M	M	M	H	M	H	L	L	L
(6) Modulus*	H	M	M	H	M	L	M	L	H	H	H
(7) Brittle Point	VL	H	L	M	M	L	M	M	M	L	M
(8) Heat Flow	L	L	L	L	L	M	H	H	H	H	H
C. Electrical											
(9) Dielectric Strength	M	L	M	L	H	M	L	L	H	H	H
(10) Resistivity	H	M	M	L	H	VH	L	VH	M	H	M
(11) Dielectric Constant	L	M	M	VH	L	L	H	L	H	L	M
(12) Power Factor	L	M	M	H	L	VL	H	VL	H	L	M
D. Chemical											
(13) Heat	F	P	F	G	G	G	P	P	P	G	G
(14) Oxygen	F	P	G	G	VG	E	G	E	E	G	G
(15) Ozone	P	P	G	P	P	E	E	E	E	E	E
(16) Oil	P	P	VG	G	F	P	VG	P	F	P	F
(17) Moisture	G	F	F	F	G	VG	G	VG	G	F	F
(18) Sunlight	P	P	G	F	F	G	G	G	G	G	G

*Stress at 300 per cent elongation.

Symbols: E=Excellent G=Good F=Fair P=Poor H=High M=Medium L=Low V=Very

Quantitative: (These values are estimates applying to dry materials at room temperature.)



✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

Brass and Wire Mill Direction

A BRASS or wire mill may accept an authorized controlled material order for a brass mill product which it does not produce, but only if it first can arrange to have the required item produced by another mill, under Supplementary Direction 9 to CMP Regulation No. 1, the War Production Board announced recently.

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IN SUCH cases, the allotment number or symbol appearing on its customer's authorized controlled material order may be extended by the brass or wire mill to the order which it places with another mill.

UNDER established CMP procedure, extension of customers' allotments or ratings by controlled materials producers is not permissible. This direction provides an exemption from the general rule under the conditions specified.

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THE direction expressly provides, however, that the material may not be used in any way by the brass or wire mill which places the order and is not to be included in reports to the War Production Board as an order which it received or filled. The mill which actually produced the material reports acceptance and shipment.

Correction

DIRECTION No. 9 to CMP Regulation No. 1 has been corrected to indicate that wire mills may accept orders for wire mill products which they do not produce, if they are able to arrange to have the required item produced by another mill.

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THE Direction, as originally issued, through oversight, did not specify that wire mills could place orders for such products.

✦ ✦ ✦

Copper Recovery Aids War Effort

THE extent to which the War Production Board's copper recovery program is aiding the Na-

(*Please turn to Page 406*)

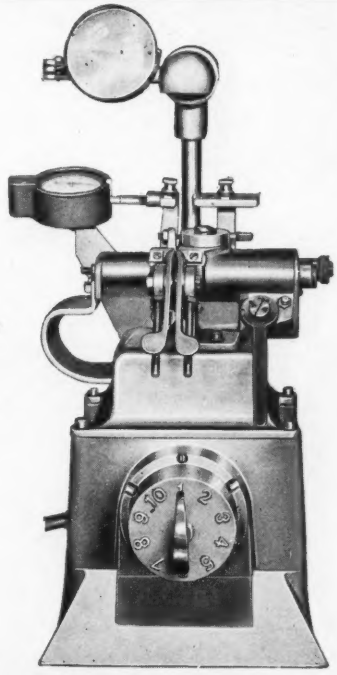
MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.

Model E.-I-S Welder Capacity .010 to .062" high & low carbon wire.



MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO, ILL.
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STANDARD

DRAWING LUBRICANTS

MAKE FOR

OF QUALITY
AND FINISH

Uniformity of quality and finish must always remain the primary objective of the wire manufacturers.

STANDARD WIRE DRAWING COMPOUNDS have the properties to fulfill demands for increased speed, longer die-life, and the highest quality of wire. One of our technical men will demonstrate the merits of our products to prove our claims.

A FEW OF OUR REPRESENTATIVE LUBRICANTS ARE LISTED BELOW

#90

For low and high carbon wire drawing on rod machines or bench. Finish suitable for rope, nails, bale tie and common wire.

#50

For high carbon spring wire. Leaves ideal coating for spring coiling machines. For both machine and bench drawing.

#33

For one or two hole extra bright market wire, welding wire and stainless steel.

#18

For wet wire drawing of copper, brass, low or high carbon steel galvanized wire.

STANDARD INDUSTRIAL COMPOUNDS COMPANY

4600 FERDINAND STREET SIC CHICAGO • ILLINOIS

Government Wire Production Information

(*Continued from Page 405*)

tion's war industries is shown by the fact that to date 197,000,000 pounds of "idle and excessive" copper, both in primary and fabricated forms, have been allocated for war use.

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THE amount, WPB announced, represents two-thirds of the total amount of copper thus far reported under the program. Of the remaining 100,000,000 pounds reported, approximately 36,000,000 pounds consist of assembled products contaminated with materials not suitable for copper scrap. Arrangements for the movement of the balance are currently being made at Copper Recovery Corporation.

✦ ✦ ✦

Magnesium Scrap

UNDER War Production Board Order M-2-b, magnesium scrap can be disposed of only by sale to a producer or approved smelter of magnesium, according to a recent announcement by the Aluminum and Magnesium Division. Sales of magnesium scrap to dealers (and hence purchases by dealers) are prohibited without specific WPB permission.

✦ ✦ ✦

ALTHOUGH a dealer may not buy magnesium scrap for his own account, he can collect magnesium scrap as an agent for a magnesium producer or approved smelter, under an agreement with the producer or smelter. Dealers who discover magnesium scrap received in a lot of other scrap metal should dispose of it by sale to a producer or approved smelter, or through a dealer who is an agent of such companies.

✦ ✦ ✦

Intra-Company Deliveries of Aluminum

THE use by a controlled materials producers of aluminum produced by him constitutes a delivery of controlled material if the aluminum is converted or processed into any other than a controlled material form or shape, and

is subject to the provisions relating to such deliveries. This means that such a producer must obtain an allotment of the necessary controlled material.

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DIRECTION 8 to CMP Regulation No. 1 provides that this procedure is also applicable to the processing of aluminum ingot into sheet, plate, bar, rod, extrusions, castings or powders; of extrusions in the form of tube looms into tubing; of rod or bar into wire, cable, rolled structural shapes or forgings; of wire into rivets; of sheet or strip into foil; of sheet or plate into forgings, pressings or impact extrusions, and of extruded shapes into forgings.

✦ ✦ ✦

Aluminum Rivet Production Exceeds Consumption

THE nation's facilities for producing aluminum rivets have been developed to such an extent that, temporarily, maximum capacity is greater than current consumption. However, with the expanding aircraft program it is expected that within a few months consumption will exceed production.

✦ ✦ ✦

TO build up a backlog of rivets against the future demand and to make full use of present facilities, the WPB has issued Inventory Direction No. 9 under CMP Regulation 2. The Direction stipulates that from today through December 31, 1943, the inventory restrictions of the CMP Regulation shall not apply to the acceptance of deliveries of aluminum rivets acquired for use in the production of aircraft or aircraft components.

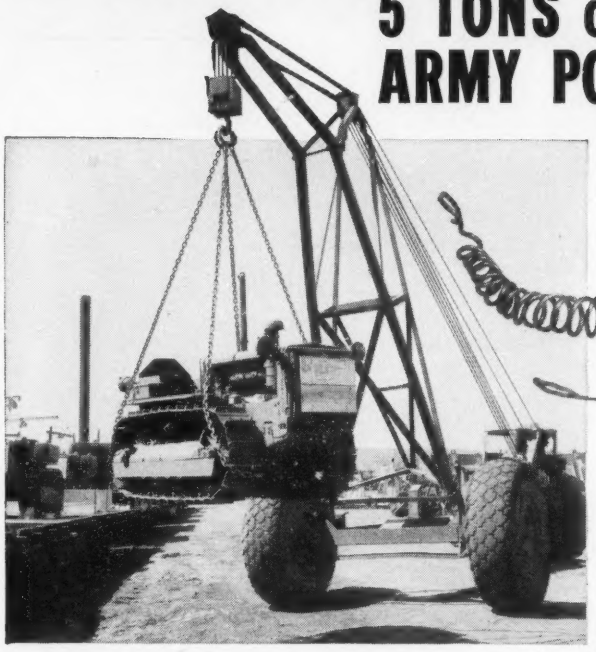
✦ ✦ ✦

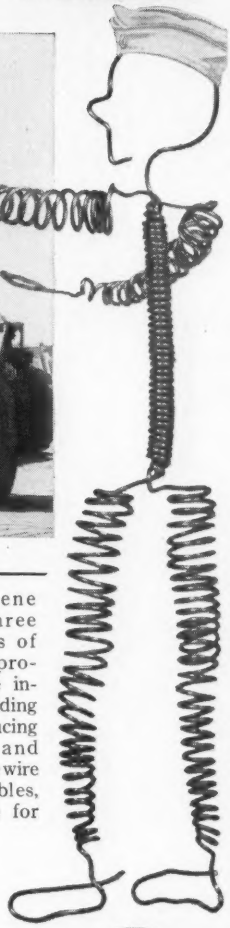
Use of Silver Saves Tin

AN estimated 3,000 tons of tin will be saved in 1943, and 5,000 in 1944 by a single use of silver-lead instead of tin-lead solder, the War Production Board announced. This large tin saving will result from the use of silver-lead solder in 40 per cent of the 1943 output and 70 per cent of the

(*Please turn to Page 408*)

Loading Another 5 TONS of ARMY POWER





KEYSTONE Wire

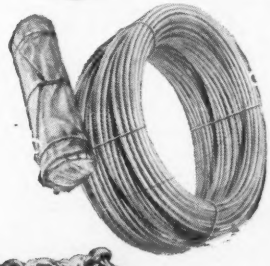
In the scene above, three major uses of wire mill production are indicated: welding rod in producing the crane and tractor, rope wire for the cables, chain wire for the sling.

Valuable time is gained loading this 5-ton package of Diesel power. A Tournacrane, equipped with several hundred feet of rugged cable, swings it quickly and easily onto the railroad car. Then comes another and another—ready for a quick trip to a battle area.

In the large number of such cranes located at key points, wire is at war. Wire mill production plays an integral role in planes, tanks, guns, ships and ammunition, too.

In these unglamorous ways, Keystone is devoting a major share of production to speeding Victory. Then we hope to be able to meet, at least partially, a towering, pent-up *civilian* demand.

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS



Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE

Continuing the Victory depends on MORE SCRAP!

FOR SALE

This equipment is not now in use and is made available to others who may be in need of it. All in good operating condition and offered subject to prior sale.

COLD ROLLING MILLS: 2 Broden Mills. Rolls 8" Dia..; 5" Face; Chain Drive; Equipped with one takeup for each 2 Mills and edge roller; DC motor, 15-20 H.P., 230 Volts, 500 to 1500 RPM; Variable Speed. 3 Rolling Mills, 2 Bliss and 1 Broden; Rolls 8" Dia., 5" face; Water Cooled and Roller Sleeve Bearings; Driven by DC Variable speed motors through gear reducers DC motors, 15-20 H.P., 230 Volts, 500 to 1500 RPM. 1 Rolling Mill (Standard) Rolls 8" dia.; 5" face; Chain drive; Rolls equipped with Broden Takeup; DC Motor 15-20 H.P., 500 to 1500 RPM, Variable Speed. 1 Set portable Straighteners for use on above Rolling Mills. 1 Roll polishing Machine for polishing rolls on edge rolls.

STRAIGHTENING AND CUTTING MACHINES: 1 Lewis #14C Machine for cutting Strip Steel 20 ft. lengths, $\frac{3}{16}$"x$\frac{5}{8}$"x$\frac{1}{4}$" Square Silent Chain, A.C. Motor Drive—440 Volt. 1 Lewis Machine for cutting $\frac{1}{16}$" to $\frac{1}{4}$" — 12 ft. lengths; 2 H.P. Motor.

1 BRADY TUBE CONVEYOR SYSTEM complete with Air Compressor and Tubes.

ROD DRAWING BENCH: 1 12 Block — 22" Single draft wire drawing bench with gear reducer drive; Motor — 150 H.P., 500 RPM, 440 Volt, 60 Cycle, 3 Phase, Speed of Block 25 R.P.M.

JONES HERRINGBONE SPEED REDUCER — Serial No. 125847; foot speed 1160; 9.2 H.P.; size 120 D.H.; ratio 24.8 to 1, service factor 1, AGNA Class 1, D.H. 4402. Triple reduction. About 3 years old.

CLEVELAND ELECTRIC TRAMRAIL No. 2500 — Type B — 60' long with 2 Shepard Class H-1 1-ton Electric Hoists — #26389 - 26399 with push button floor control; Trumbull 30-amp. 500-volt switch.

CLEVELAND ELECTRIC TRAMRAIL consisting of: 1-84' length #2100 tramrail with #2180 clamp and 8" hanger rods; 30" centers — bolted on 8" I beam support; 1-84" length #2100 tramrail with #2180 clamp and 48" hanger rods; 5' centers and #2193 conductor bar supports — 5' centers and $\frac{5}{16}$"x3"; $\frac{7}{8}$" conductor bars 2 sides on 8" I beams — supports bolted to building trusses. Cleveland 8"x18' I beam bridge traveling cranes with 2 4-wheel trucks and Shepard class HI 1-ton electric hoist with push button floor control. 3 Vaughn type USGB block stripper cages Tumbull 30-amp. 500-volt switch.

2 SHEPARD HOISTS, 2000 lbs. Capacity; 70' per minute lift; face plate control; each with a 7-$\frac{1}{2}$ H.P. Zobell Motor, 1700 RPM, 440 Volts, 10.5 Amps; slip ring induction, Serial No. 7157, 13157 and 8812.

4 WET WIRE DRAWING FRAMES, 12 Blocs each Frame; 8" Diameter; Complete with reels and liquor crocks; Drawing sizes from #17-$\frac{1}{2}$ to 24 gauge; Equipped with AC Motor, 15 H.P., 690 RPM, 440 Volt.

1 STEAM AIR COMPRESSOR (Ingersoll-Rand) Class F.R. 1, No. 30915, Steam Cylinder — 12 by 10, Air Cylinder — 12 by 10.

1 5" CRANE Globe Valve No. 250 — Flange Valve — New.

1 6" CRANE Globe Valve No. 250 — Screw Valve — New.

1 STEAM WATER PUMP (National Steam Pump Co., Upper Sandusky, Ohio) Class B — No. 22673, Size 20x10x20.

1 TEMPERING FURNACE (Surface Combustion Co.) Catalogue No. 680, Serial No. 160441-1, Door Approximately 4-$\frac{1}{2}$"x8", Gas Fired.

1 ELECTRIC OVERHEAD TRAMRAIL CONVEYING EQUIPMENT for conveying coils of wire or rods, Automatic Control, Manufactured by Louden Machinery Company. 3 New C 7602B $\frac{3}{8}$" C.P. Self Closing Pedal Supply Valves, Manufactured by Crane Company (Special for Hospital Use) New.

CAST IRON FITTINGS: 4-8" L's, 2-8" T's, 2-8" Plugs. 46 lbs. $\frac{1}{16}$" Nickel Welding Rods (Known as No. 175 Cold Drawn Grade).

Address Inquiries to

THE SENECA WIRE & MANUFACTURING CO.
FOSTORIA, OHIO

Government Wire Production Information

(*Continued from Page 407*)

1944 output of cans for foods, household products, chemicals and other purposes.

✦ ✦ ✦

THE silver-lead solder contains about 2.5 per cent silver, 5 per cent tin and 93.5 lead, while the tin-lead solder contains 30 to 40 per cent tin and 60 to 70 per cent lead. And since lead has almost ceased to be a critical material — all restrictions having recently been removed from its use for essential purposes — the increased consumption of that metal is no problem.

✦ ✦ ✦

Steel Welding Wire

ACCORDING to a recent announcement by the American Iron and Steel Institute, production of steel welding wire by the steel industry in 1942 reached approximately 800,400,000 pounds, almost double the record output of 1941, when 453,120,000 pounds were produced.

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TREMENDOUS increases in the output of ships, tanks, aircraft and other welded articles of warfare were largely responsible for this huge output of welding wire.

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Bolt, Nut, Screw and Rivet Types Redefined

THE types of bolts, nuts, screws and rivets covered by Maximum Price Regulation No. 147 (Bolts, Nuts, Screws and Rivets) have been redefined by the Office of Price Administration, effective June 22, 1943.

✦ ✦ ✦

THE redefining draws a more specific line of demarkation between the special machined-from-bar bolts, nuts, screws and rivets covered by Maximum Price Regulation No. 147 and the other screw machine products for which maximum prices are established in Maximum Price Regulation No. 136

(Machines and parts and Machinery Services).

✦ ✦ ✦

UNDER the new definition of items covered by Maximum Price Regulation No. 147, the regulation provides maximum prices for all bolts, nuts, screws and rivets manufactured from ferrous or nonferrous metals other than aluminum, except the following:

1. **Screw machine products other than bolts, nuts, screws and rivets. "Screw Machine Products" in general are prices under Maximum Price Regulation No. 136 (Machines and Parts and Machinery Services).**
2. **Products sold as "Pole Line Hardware" for use in transmission or distribution line construction, which are priced under Maximum Price Regulation No. 136.**
3. **Wire nails, which are priced under Revised Price Schedule No. 6 (Iron and Steel Products).**
4. **Cut nails, cut tacks, cotter pins or washers, which are priced under the General Maximum Price Regulation.**
5. **Pipe plugs and fittings, which are priced under Maximum Price Regulation No. 188 (Manufacturers' Maximum Prices for Specified Building Materials and Consumers' Goods Other than Apparel).**
6. **Solid or flexible staybolts, which are priced under Maximum Price Regulation No. 136.**

✦ ✦ ✦

CMP Regulation No. 2 Interpretation

THE following official interpretation has been issued with respect to CMP Regulation No. 2 (§ 3175.2), as of June 19, 1943:

✦ ✦ ✦

PARAGRAPH (b) (1) of CMP Regulation No. 2 prohibits the acceptance of delivery of any item of controlled material if the user's inventory of such item is, or will by virtue of acceptance become, greater than the maximum prescribed. For the purpose of this regulation, material is considered to be inventory until it is actually put into process or is actually installed or assembled. Putting into process does not include minor initial operations, such as painting, and does not include any shearing, cutting, trimming or other operation unless such initial operations are part of a continuous fabricating or assembling operation. Nor does it include operations such as inspection, testing and ageing nor segregation or earmarking for a specific job or operation.

✦ ✦ ✦

FOR example, if a manufacturer who uses wire or rod cuts a sufficient quantity of it to length at one time to maintain his operations for a considerable period of time, the cut pieces remain as inventory until processed into another form or until assembled or installed.

Gets Army-Navy Production Award

JOHN ROYLE & SONS, 10 Essex St., Paterson, N. J., was given the Army-Navy Production Award for Excellence in the production of war equipment, at a presentation made to the Company and its employees at its plant on May 26th, 1943.

Can You afford TO PASS UP THIS 50% Saving IN TIME AND FUEL?

Patented and Patents Pending

Carl-Mayer Hi-Speed Rod Baker is the fastest rod baker built — no other rod baker even approaches its speed and economy. Blow-Off Feature removes moisture without bumping or agitating the coils.

But you don't need to take our word for it! Let us tell you where you may see this remarkable rod baker in operation and consult with enthusiastic users. Past performance is a guarantee of results to come.

CARL-MAYER HI-SPEED TRADE MARK ROD BAKER

The Carl-Mayer Corp.
3030 Euclid Ave., Cleveland, O.

ROD BAKERS, WELDING ROD OVENS, INDUSTRIAL FURNACES

A FEW CARL-MAYER CUSTOMERS:

Allegheny Ludlum Steel Co.
Aluminum Co. of America
Atlantic Wire Co.
Atlas Steel Co.
American Magnesium Corp.
Bridgeport Brass Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Ford Motor Co.
General Motors Corp.
Hollup Corporation
Hyatt Roller Bearing Co.
Johnson & Nephew, Ltd.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Reliance Manufacturing Co.
Steel Co. of Canada
Timken Roller Bearing Co.
Thompson Products Co.
Weatherhead Co.
Wickwire Spencer Steel Co.

Outstanding Personalities of the Wire Industry

H. F. Clarke, Director, Spring Mill Products, American Steel & Wire Co.

THE appointment of **H. F. Clarke** as director of spring mill products was recently announced by the American Steel & Wire Company, Cleveland, Ohio, following the resignation of **Leonard C. Peskin.**

✦ ✦ ✦

MR. CLARKE'S first association with the Company was in December, 1936, when he started as a technical apprentice at Central Works, Worcester, Mass. He was transferred to South Works in March, 1938, where he served in various capacities until being named assistant superintendent of the spring mill in September, 1941.

Albert S. Rairden Heads Riehle Sales

APPOINTMENT of **Albert S. Rairden** as Sales Manager of the Riehle Testing Machine Division of American Machine and Metals, Inc., has been announced.

✦ ✦ ✦

MR. RAIRDEN, identified with the steel industry for the past twenty years, is a well-known authority on wire rope, having presented many lectures on this subject before engineering societies and trades associations throughout the country. He has also assisted the U. S. Bureau of Standards in compiling Federal specifications on wire rope and rope wire, and the U. S. Army Air Corps in its specifications for steel wire control cords.

FOR the past ten years, Mr. Rairden has been associated with Wickwire Spencer Steel Company, where he was in charge of sales engineering and sales of wire rope. Prior to that, he was chief engineer of American Cable Company and Hazard Wire Rope Company. Before that he was production superintendent of the wire rope plants of American Steel & Wire Company in Worcester, Massachusetts and New Haven, Connecticut.

✦ ✦ ✦

John W. Callaghan

JOHN W. CALLAGHAN, 71, president and treasurer of the White Wire Works, Co., Rochester, New York, manufacturers of grilles and guards, died June 3rd, in that city.

ROBINSON TUBE-TYPE WIRE STRANDERS

COMPLETELY REDESIGNED!

Sage engineering . . . Sound construction . . . and the knowledge gained through the exchange of ideas with customers . . . All are embodied in the advanced design and superior operation of the new improved Robinson Wire Strander. Full information available upon inquiry!

ROBINSON MANUFACTURING COMPANY
WORKS — MUNCY, PENNA.

Sales Representatives

MERCER-ROBINSON CO., INC., 30 CHURCH ST., NEW YORK

UNIQUE

Lorin W. Grubbs, Norton Company, Lieut. (j.g.), U. S. Navy

LORIN W. GRUBBS, abrasive engineer for Norton Company, Worcester, Massachusetts, for the states of Virginia, North Carolina, South Carolina and part of West Virginia and Tennessee has been commissioned a Lieutenant (j.g.) in the United States Navy. **Charles A. Babbitt,** who has had experience in the Norton research laboratories and in field work, will take over Mr. Grubbs' territory.

+ + +

Curtis A. Gordon, Rolling Mill Supt., Wickwire Spencer Steel Company

FOLLOWING the retirement of **A. J. Wheeldon,** for 22 years rolling mill superintendent, **Curtis A. Gordon** has been appointed to that position by the Wickwire Spencer Steel Co., Buffalo, N. Y.

+ + +

MR. GORDON was formerly associated with the Rustless Iron & Steel Corporation of Baltimore, Md.

+ + +

George W. Person, Manager Abrasive Div., Screw Machine Supply Co.

GEORGE W. PERSON, formerly Abrasive Engineer in the St. Louis territory for Norton Company, Worcester, Massachusetts, has taken a position in Chicago as manager of the Abrasive Division of Screw Machine Supply Company, one of Norton Company's Chicago distributors.

+ + +

R. M. Cherry, Asst. Mgr., Industrial Heating Division, General Electric Company

R. M. CHERRY has been appointed assistant manager of General Electric's industrial heating division. Mr. Cherry became associated with General Electric in 1919 as a testing engineer and worked in the Schenectady and Pittsfield plants. In 1922 he was named industrial heating specialist at the Philadelphia office and in 1924 entered the industrial heating engineering department at Schenectady, later being transferred to the industrial engineering department there. Since 1936 Mr. Cherry has been connected with the industrial heating division.

+ + +

F. R. Morral, Industrial Fellow, Mellon Institute of Industrial Research

F. R. MORRAL has resigned as assistant professor of metallurgy, Pennsylvania State College, to take an industrial fellowship at Mellon Institute, Pittsburgh.

+ + +

Book On Wood

A NEW illustrated book for executives and engineers, **Wood and its Place in the War Effort,** is available without charge to companies engaged in war work. Published in limited edition. Write to Kay Displays, Inc., 9 East 40th Street, New York, N. Y.

Engineering Information

ON HIGH PRODUCTION OVENS

A limited number of copies of our engineering manual, "Blueprint for Industry — Part II", are still available to executives, engineers and research men. This publication covers basic engineering information on all types of standard and special industrial ovens for process and heat treatment. Special emphasis is placed on automatic handling and related attendant-saving accessory equipment.

Write for your copy on your letterhead.

The INDUSTRIAL Oven Engineering COMPANY

Engineered Industrial Ovens • Special Handling Equipment • Contract Engineering

11621 DETROIT AVE. CLEVELAND, OHIO

A Review of Recent Wire Patents

No. 2,318,160, WIRE STRAIGHTENER, patented May 4, 1943 by Charles D. Johnson, Worcester, Mass., assignor to Johnson Steel and Wire Company, Inc., Worcester, Mass., a corporation of Massachusetts.

Relatively small rolls are employed, ball bearing mounted, and arranged in two rows.

✦ ✦ ✦

No. 2,318,419, APPARATUS FOR COATING METAL STRIP OR WIRE, patented May 4, 1943 by Ernest B. Plott and John S. Stanier, Youngstown, Ohio, assignors to The Youngstown Sheet & Tube Company, Youngstown, Ohio, a corporation of Ohio.

Small rolls are provided over which the strip of material is bent, causing fragmentation and at least partial detachment of scale adhering to the material. Thereupon rotary wire brushes engage the strip where it is convexly bent, whereupon the strip enters a coating bath.

✦ ✦ ✦

No. 2,318,614, ART OF PRODUCING WIRE, patented May 11, 1943 by William E. Leonard, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

Dry drawing lubricant is applied to the wire stock, and the stock is drawn to produce wire with its surface contaminated by the dry drawing lubricant, after which there are the steps of wetting the wire with a metallic salt to wet the dry drawing lubricant contaminating its surface and to plate its surface with the metal of the salt and wet drawing the wire while wetted with the metallic salt to produce the wire with its surface clean, the metal plated on the wire's surface and the metallic salt solution serving to lubricate the wire during the wet drawing.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

No. 2,319,619, APPARATUS FOR COILING STRIP METAL, patented May 18, 1943 by Frank Marquart and William H. Stivason, Cleveland, Ohio, assignors to The American Steel & Wire Company of New Jersey, a corporation of N. J.

Operation of the apparatus is aided by the strip itself, portions of which form part of an electric circuit, as it is being coiled.

✦ ✦ ✦

No. 2,319,684, SPRING CONSTRUCTION, patented May 18, 1943 by Frank J. Horton, Detroit, Mich., assignor to F. L. Jacobs Company, Detroit, Mich., a corporation of Michigan.

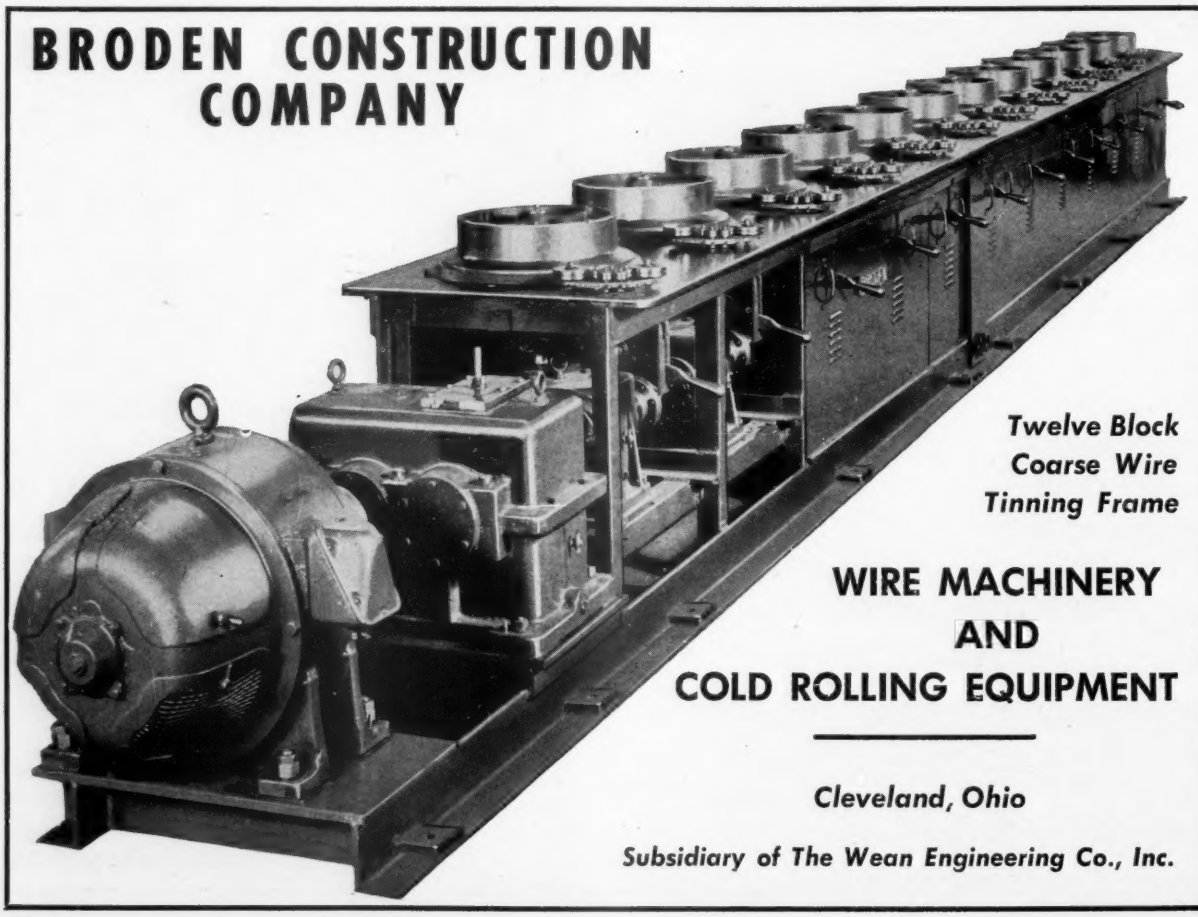
The spring comprises a single sinuously bent wire having curved portions alternately arranged on opposite sides of the axial line and tangent to zig-zag lines on opposite sides of this axial line and substantially parallel thereto, the alternate curved portions being joined by parallel straight portions oblique to the axial line.

✦ ✦ ✦

No. 2,319,827, MEANS FOR MANUFACTURING WIRE ROPE AND THE LIKE, patented May 25, 1943 by Eugene J. Reardon, East Haven, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

This machine includes a number of rotatably arranged cradles with each adapted to hold a coil of strand material, means for laying the strands of material, means for applying tension to each of the strands as they pass from the cradles to the laying means, including a pair of oppositely disposed rotatable drums arranged between each of these cradles and the laying means which are adapted to rotate simultaneously with the cradles, and means for retarding the rotation of at least one of the drums, the strand material adapted to pass around both of their respective drums so as to place that portion of each of these strands between the drums and laying means under tension as the strands pass thereto.

BRODEN CONSTRUCTION COMPANY



Twelve Block Coarse Wire Tinning Frame

WIRE MACHINERY AND COLD ROLLING EQUIPMENT

Cleveland, Ohio

Subsidiary of The Wean Engineering Co., Inc.

No. 2,319,828, WIRE UNCOILING APPARATUS, patented May 25, 1943 by Charles R. Rohweder, Belmont, Mass., assignor to United Shoes Machinery Corporation, Flemington, N. J., a corporation of N. J.

In this apparatus, there is a support for the wire coil, a tubular take-off arm mounted to rotate about an axis substantially central of a coil of wire on the support, this take-off arm having a flexible resilient intake end, whereby the end is adapted to deviate from a circular path around the coil of wire in response to rotation of the take-off arm about the axis in the uncoiling operation.

✦ ✦ ✦

No. 2,320,020, SPRING MATTRESS AND THE LIKE, patented May 25, 1943 by Lionel Selby Wallis, Birmingham, England.

Ends of each two adjacent coils overlap, and a wire, having a downwardly stepped portion seated in the overlapping ends, are joined by a clip, which is pivotally connected to one coil.

✦ ✦ ✦

No. 2,320,153, SPRING CONSTRUCTION, patented May 25, 1943 by Alexander W. Moske, Jackson, Mich., assignor to Reynolds Spring Company, Jackson, Mich., a corporation of Delaware.

The wire helical coils are pig-ringed together so as to permit lateral displacement of the wires.

✦ ✦ ✦

No. 2,320,201, ELECTRICAL CONDUCTOR, patented May 25, 1943 by Julius A. Szilard, Rome, N. Y., assignor to General Cable Corporation, New York, N. Y., a corporation of New Jersey.

A mold and rot resistant fibrous jacket surrounds the wire conductor and is saturated with a phenolic tarry residue of diphenyl oxide distillation.

✦ ✦ ✦

New Di-Acro Shear

O'NEIL-IRWIN Manufacturing Company, Minneapolis, Minn., announces an improved shear, their Di-Acro Shear No. 2, which is heavier, stronger and more accurate and easier to operate than its predecessor. This new model is part of their equipment used in their process for duplicating metal parts without the use of dies. Shear blades are reversible to provide double service without re-sharpening. Detailed description and specifications will be furnished to interested parties by the Company upon request.

✦ ✦ ✦

New Guide Book Available for Users of Brass and Copper

A UNIQUE catalogue and guide book has just been issued for distribution to the war industries using brass and copper products by The Eastern Brass & Copper Company, 515 Greenwich Street, New York City, large distributors of these products.

✦ ✦ ✦

IN addition to the usual general stock outline the book contains a copper and copper alloy digest, a complete table of weights and measures, all of the government specifications and numerous other items and miscellaneous data.

✦ ✦ ✦

A COMPANY announcement states that the book is the only one of its kind that encompasses all of the necessary copper and brass information by mill fabricators. Copies can be obtained by all war contractors by addressing **W. E. Bargar,** advertising manager.

JUST THE TICKET . . .

for INCREASED TONNAGE HIGHEST ACCURACY SMOOTHER FINISH

WIRE and BAR DIES
EXTRUDING DIES
TUBING DIES
SIZING DIES

IF YOU wrote your own ticket for wire drawing dies, you couldn't ask for more advantages than you get in TECO Carbide Dies.

Made to rigid standards of carbide manufacture and die fabrication, TECO Carbide Dies produce at higher speeds, for longer runs — resulting in greater tonnage of accurate, smooth-finished wire.

Prove these facts with a test run on your machines. Our engineers are glad to discuss your needs.

TUNGSTEN ELECTRIC CORPORATION
564 39th STREET UNION CITY, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Rep.: Architects and Builders Bldg., Indianapolis, Ind.

TECO
Pioneers in Tungsten Carbides for over a Quarter Century
CARBIDE DIES

New Communication System

ONE of the most effective aids in modern warfare is rapid and dependable communications. The success of an engagement may depend on establishing lines to advanced positions in minimum time. To aid the Signal Corps in such work, the Western Electric Company and Bell Telephone Laboratories have recently made available a new communication system known as "Spiral-4."

✦ ✦ ✦

THE basic idea behind Spiral-4 is borrowed from "carrier" telephony, a peacetime development of the Bell System by which several long-distance messages can be transmitted simultaneously over a set of conductors. The Spiral-4 system provides three telephone and four telegraph circuits over a single rubber-covered cable about the thickness of a fat lead pencil. The cable contains four spiralling wires. Hence, the name. It is made in quarter-mile lengths, the ends of which are fitted with weather-proof connectors. Each length may be snapped to a companion section as rapidly as the cable can be payed off a moving Army truck. With intermediate amplifiers spaced along the way to compensate for loss in the strength of the current, distances up to 150 miles may be so spanned.

✦ ✦ ✦

THE seven telephone and telegraph messages cannot be piped directly into the cable. If this were done, they would become hopelessly mixed and garbled. Instead, an electronic instrument at either end of the line first generates "carrier" currents. These currents are cousins of the familiar radio wave. Such currents can retain their identity while intermingling freely in an electrical circuit. The individual messages are then superimposed on the carrier currents, by the terminal mechanism, and, so mounted, ride through the cable pickaback. Upon arrival at the distant end, the electronic device tosses the carrier current into the discard and guides each signal into its own pair of telephone wires.

✦ ✦ ✦

UNLESS he were equipped with a highly-complex electronic device of special design, an enemy tapping the Spiral-4 ahead of the terminal point would get nothing for his trouble but an unintelligible mixture of squeaks and squeals.

✦ ✦ ✦

New Catalog Describing Heavy Duty Wire Loom

THE Mummert-Dixon Company of Hanover, Penna., recently perfected a new heavy duty, heavy purpose wire loom that incorporates several new and original engineering features for either plain or twill weaving.

✦ ✦ ✦

THIS loom is described in a new 16-page illustrated catalog that may be had by addressing the Company. The purpose of the loom is to make heavy grades of wire screen which are beyond the capacity of the unusual heavy duty loom.

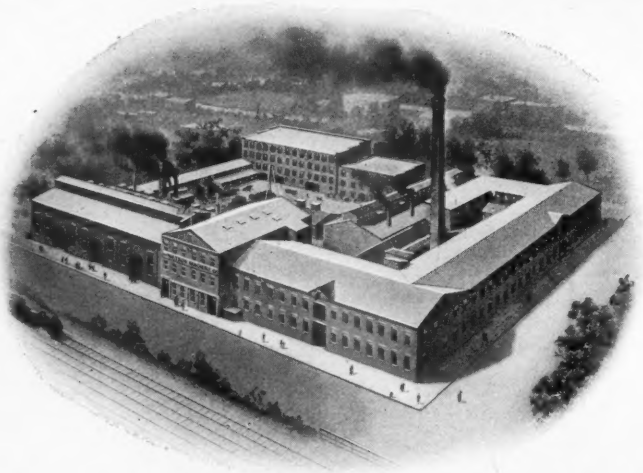
THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

Stranders
Bunchers
Cablers
Closers
Armor. Machines
Tapers
Juters
Serving Heads
Compound Tanks
Saturating Tanks
Powderers and Chalkers
Capstan Sections



Let-offs
Gang-Spoolers
Re-winders
Capstan Takeups
Continuous Takeups
Heavy-Duty Takeups
Traverses
Measuring Mach's.
Testing Mach's.
Vulcanizers
Polishers
Reel Crutches

MEAS. MACH'S., TRAVERSES, REEL CRUTCHES, BUNCHERS, SMALL POWDERERS, ETC. — USUALLY CARRIED IN STOCK

LITERATURE AVAILABLE ON ALL LISTED UNITS

Factors in Company Relations

(*Continued from Page 402*)

THIS is typical of the reaction. The ties between the company and its stockholders are measurably closer and, further than that, there is the community of interest established between the employee and shareholder, with both putting a share of their income into War Bonds. Here is visible evidence of both groups working shoulder to shoulder in a common cause.

✦ ✦ ✦

IT is pertinent to point out that the 10.6 percent subscription is well above the national average of War Bond buying, and it provides proof that the stockholder is willing to do his share when given the opportunity. It is interesting to note an estimate by competent authorities that some $500,000,000 could be diverted into war securities by a general adoption of the plan.

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AS of this writing we have declared another quarterly dividend with the same option, and while the full returns have not yet been received, I am confident that the second response will be even better than the first.

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FROM our practical experience I can say with complete assurance that good stockholder relations pay dividends. In my opinion, industry in general is losing an opportunity when it fails to utilize the power in this great body. Not all stockholders are versed in industrial affairs nor informed as to business procedures which seem so common place to representatives of management. A continuing process of education would acquaint stockholders with the problems of management and benefit all concerned.

✦ ✦ ✦

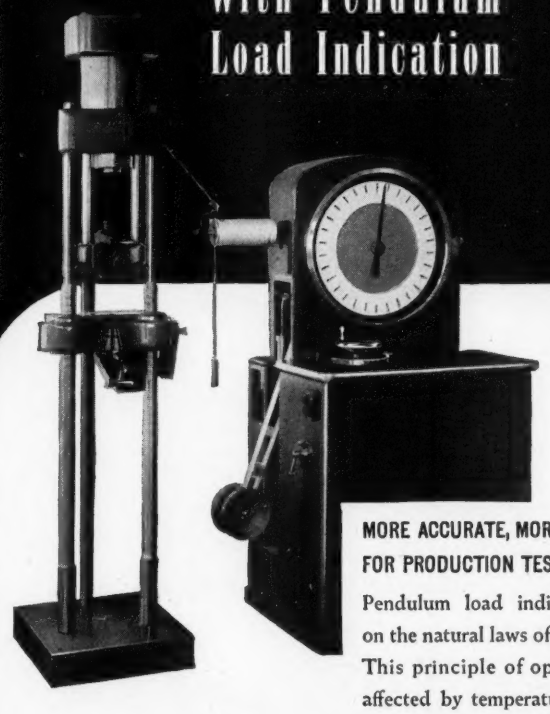
THE answer to this broad problem of company relationships is in the hands of individual management. It is management that must inform and enlighten all the human elements with which it comes in contact. To gain and to hold the confidence of workers and stockholders and to enlist their support is a worthy objective at any time, particularly so when our country is at war.

✦ ✦ ✦

Crescent Company Expands

THE Crescent Company, Pawtucket, R. I., recently has installed additional modern equipment, among which is a special cabling machine to meet the tremendously increased demand for aviation, automotive, welding and other Wiry Joe wire and cable for war production. Manufacture of the cabling machine referred to required nearly eight months. Delivery of other wire-making machinery is scheduled for this summer. The addition of this equipment will greatly increase Crescent's production facilities.

PRECISION
HYDRAULIC TESTING MACHINE
with Pendulum
Load Indication



MORE ACCURATE, MORE DEPENDABLE FOR PRODUCTION TESTING BECAUSE:

Pendulum load indicator operates on the natural laws of gravitation.... This principle of operation is not affected by temperature changes or subject to metal fatigue. . . . *Write for descriptive literature and quotations.*

ARMY E NAVY

RIEHLE
TESTING MACHINES
Division of
American Machine and Metals, Inc., East Moline, Illinois

Other Products: IMPACT TESTERS · VICKERS HARDNESS MACHINES
BRINNELL HARDNESS TESTERS · MEASURING INSTRUMENTS

The Drawing of Zinc Coated Wire

(Continued from Page 400)

Mr. Lewis: Yes, just as you told me in the letter. Mr. ————, I suppose after what you have said, you wouldn't dare get up and say you had a special lubricant for drawing this stuff wet?

Member: No, I have some for the dry but not for the wet; I mean, I don't think that is important. It is a little important, of course. For instance, say you are getting a thousand pounds on your finishing die on .009 or .010. Well, if the right lubricant is in there, it will stay with the wire. There is such a thing as having it stay with the wire, carrying it through the different drafts, and if you have a good lubricant, like ours, you might get 1100, you see. If you get one of these other common lubricants, you might get 1000. There is about that much difference, say, 10 per cent. But when you get two or three hundred pounds compared with a thousand, or, as some of my friends get, 2300 or 2400, they don't believe me.

Mr. Lewis: I ought to charge you for this plug! May I announce that you will be taking orders in the back of the room during the next intermission? (Laughter) Mr. ————, are you here now?

Member: Well, there isn't anything that I can say. I am the fellow who came here to learn what I could about it. I represent a lubrication company and we have lubricants that are being used successfully, but they don't work the same in every factory. We try to find something that will do the job. But, as I say, I am trying to see if I can learn something here.

Mr. Lewis: All you have learned so far is that it doesn't make any difference what the lubricant is. (Laughter) Mr. ————, can I ask you a question? When you speak of 50 per cent bearings, you are speaking of a bearing that is put in from the entering side of the die, I take it, or is it from the exit side of the die? Tell me which.

Member: It is from the entering side.

Mr. Lewis: From the entering side. Well, then, if it is put in from the entering side, it will have a slight taper?

Member: That's right.

Mr. Lewis: In the same direction as the drawing cone, so that the wire will bear on that bearing for its full length.

Member: In addition to that you finish the smaller die on the Pohenkra, which gives it more of a parabolic shape than a straight taper or a straight bearing.

Mr. Lewis: Mr. ————, are you here? Do you know anything?

Member: Not a thing.

Mr. Lewis: I know you never used to, but you might have learned something since I saw you last. Are you fellows drawing some galvanized wire?

Member: Not I, no.

Mr. Lewis: How about you, ————? I saw him here earlier this evening—the celebrated student of Chinese philosophy. I understand Confucius says that it is easier for a camel to pass through the eye of a needle than for a galvanized wire to pass through a carbide die. (Laughter) I thought I would ask you if you found that to be true. Are you still here, Mr. ————?

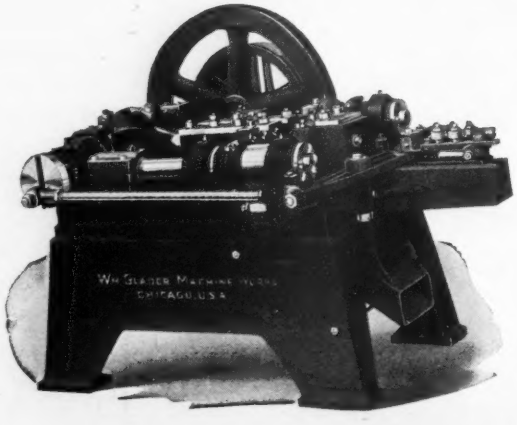
Member: Right here. I can't say an awful lot about it myself. On the soap discussion, all I know about the lubricant we use is that one is 501 and the other is 506, and one of them we use on coppered wire, and we find that is equally good on the galvanized wire. On the production, on the dies, with the diamond die, we can run, maybe, 10,000 pounds. Of course, sometimes you won't get 10,000 pounds in the hot galvanized wire. It isn't so bad now, but our big difficulty was with lumpy wire, rust spots. Of course, you have that with copper wire, too, but as for the lubricant, I don't know; I would like somebody to tell me just why it is that the lubricant is so important, because I think it is. I may be wrong, from what I have heard here tonight. Some think it doesn't matter. If someone could give me a reason for the difference and the importance of the lubricant, I would like to know them.

Mr. Lewis: Well, that is what we have been groping for, and we got all kinds of opinions. The most honest opinion, the one that seems most plausible to me, is the one that the lubricant man gave us, that the nature of the wet lubricant doesn't make a hell of a lot of difference. Is Mr. ———— still here or is he under the table? Are you there, ————?

Member Yes.

Mr. Lewis: Do you do any of this work?

Member: We have done a little.



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Mr. Lewis: What do you know about it?

Member: We had some trouble to begin with, in climbing the block, both wet and dry

Mr. Lewis: Some trouble in making it climb the block?

Member: Yes.

Mr. Lewis: Both wet and dry?

Member: Yes.

Mr. Lewis: Have you been drawing bethanized or hot?

Member: The bethanized; the electro-galvanized.

Mr. Lewis: You use different lubricants than what you have been using on ordinary fine wire?

Member: No, I would say not.

Mr. Lewis: How is your die life?

Member: We have had very good results as far as die life goes.

Mr. Lewis: Have you adopted any particular die shape for that work?

Member: Pretty generally what the die producers have supplied us.

Mr. Lewis: Do you use a smaller angle for the wet drawing than you do for the dry?

Member: Call on Mr. ———— will you? He can tell you more about the details of that than I can.

Mr. Lewis: All right, get him up.

Member: Naturally, we would, because the dry drawing is the heavier draft.

Mr. Lewis: Would you say that you use about the same angle and die shape in galvanized wire, whether wet or dry, that you would use in uncoated wire, or do you make a change specifically to take care of the fact that you have zinc-coated wire?

Member: Very little, except to shorten the bearings some.

Mr. Lewis: You do shorten the bearings?

Member: Yes.

Mr. Lewis: Do you find that it pays to be more careful about easing the cones and bearings into each other?

Member: Yes, no sharpness.

Mr. Lewis: Do you think it is more important than it is on ordinary lime-coated wire?

Member: Yes, we do; yes.

Mr. Lewis: Can you add anything to the bits of ignorance that we are picking up here?

Member: Not unless there is something direct that I can answer.

Mr. Lewis: Well, there have been a lot of questions asked that haven't been answered yet. Where were you? (Laughter)

Member: I was right here.

Member: Say, Ken, we found out, not only in galvanized wire, but when we started drawing lime-coated wire, rather than copper-coated or liquor-finished wire, that when we changed to the no-bearing proposition, we got a better result; that is, with no bearing or practically no bearing. It didn't seem to make so much difference to the copper-coated or liquor-finished wire.

Mr. Lewis: Well, it is twenty minutes past eleven now and I am not going to try to hold you here any longer unless you feel you want to stay and discuss this thing among yourselves. Can anyone add to what has been brought out, or has anyone any questions that haven't been answered, that he wants to put again?

Member: I would like to have just a little more discussion in regard to the pros and cons of using lime on bethanized or zinc-coated wire, or on low or high carbon wire, medium and high carbon and bethanized, to see if a greater or smaller percentage of the folks are using or not using lime in the drawing.

Mr. Lewis: Well, let's run over it. Mr. ————, lime or no lime?

Member: We don't use any lime at all.

Mr. Lewis: Mr. ————, you have tried it both ways?

Member: Yes, we have tried it both ways. We use lime, I should say.

Mr. Lewis: You like the lime?

Member: Yes.

Mr. Lewis: Mr. ————, you are using lime, you are lime-coating it?

Member: No.

Mr. Lewis: No lime coating, even for starting your dry drawing?

Member: No.

Mr. Lewis: And you are having pretty darned good results. Mr. ————?

Member: No lime.

Mr. Lewis: Have you tried it?

Member: Yes.

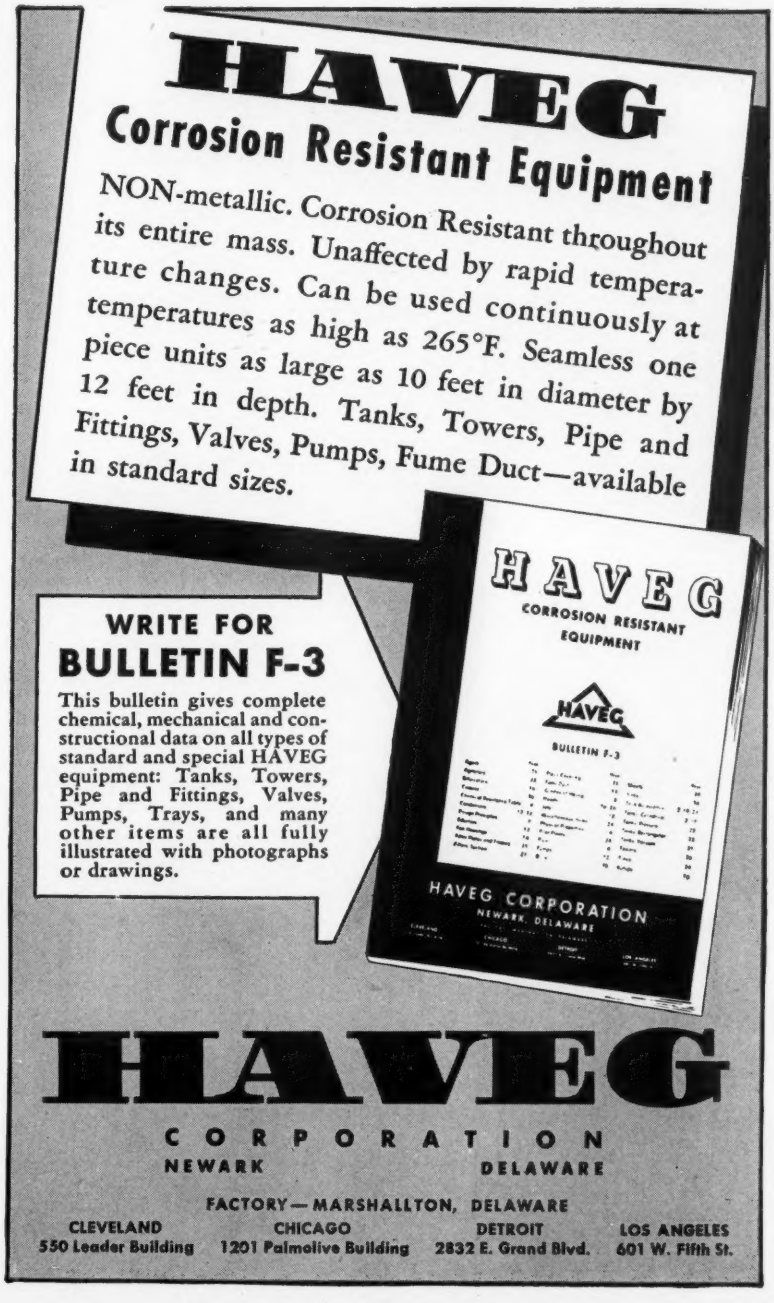
Mr. Lewis: And don't like it?

Member: No.

Mr. Lewis: Carl, what is the next item on the program?

Chairman Johnson: Well, I certainly appreciate your help, Ken, and I appreciate the response from the floor. I think it has been a wonderful meeting. I think there is one thing that we can point out,

(Please turn to Page 418)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The Drawing of Zinc Coated Wire

(Continued from Page 417)

in some of the remarks that Ken has picked up, that both bethanized and hot galvanized are being drawn equally well. That kind of takes the commercial aspect out of it for me a little bit, but I think I could say one thing, and that is, that probably the advent of bethanized wire has stimulated or created some interest in the drawing of zinc-coated wire which has brought it to its place today.

It is getting late, and if there are no more questions, we will have a movie.

(The technical session concluded at eleven twenty-five, following which a motion picture was shown.)

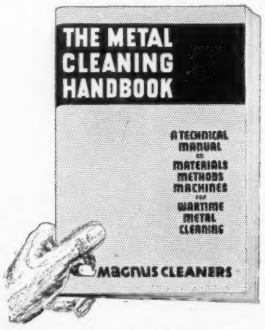
✦ ✦ ✦

Metal Cleaning Handbook

THE Magnus Chemical Company, Inc., manufacturers of metal cleaning materials, metal drawing lubricants and washing, drying and pickling equipment, has just issued a new 72-page illustrated manual, **"The Metal Cleaning Handbook."**

✦ ✦ ✦

THE handbook provides an organized means of selecting cleaning materials, methods of use and types of washing equipment best adapted to the cleaning of various kinds and shapes of metal articles.


THE METAL CLEANING HANDBOOK
A TECHNICAL MANUAL ON MATERIALS METHODS MACHINES FOR WARTIME METAL CLEANING
MAGNUS CLEANERS

THE first half of the book is devoted to cleaning materials and the factors governing the selection of compounds. Each four main classes of cleaning materials, namely: Solvent Cleaners, Petroleum Spirit Cleaning, Alkaline Cleaners and Emulsifiable Cleaners is discussed separately, indicating the kinds of metals and articles each class is best suited for, its major uses and its disadvantages.

✦ ✦ ✦

ALL types are discussed, from simple dip tanks to fully automatic, continuous conveyor ma-

chines for washing, rinsing, drying, cooling and pickling operations. Machines, besides being described, are pictured in blueprint form. Tables, charts and pictures supplement the text.

✦ ✦ ✦

METAL processing operations such as drawing, lubricating, burnishing and anti-rusting are covered. Copies of the "Handbook" can be obtained by writing the Magnus Chemical Company, Dept. W, Garwood, N. J.

✦ ✦ ✦

"Blueprint for Industry"

THE above is the title of a booklet of engineering information on convection heated ovens for batch and continuous heating processes used in armament production, recently issued by the **Industrial Oven Engineering Co.**, 11621 Detroit Avenue, Cleveland, Ohio.

✦ ✦ ✦

THIS book is illustrated entirely by reproductions of blueprints showing typical installations of oven and materials handling equipment. Starting with a convection-heated box type or single compartment oven, the descriptions go on to cover multiple compartment ovens, continuous ovens and furnaces, multi-pass conveyor ovens for preheating, double-dipping, baking and cooling, and a number of complete oven-materials-handling systems.

✦ ✦ ✦

INCLUDED is a continuous system for pickling, rinsing, scrubbing, drying, paint dipping and baking of steel sheets; a two-zone conveyor-type baking oven for welding rod and wire; a three-zone continuous double compartment core oven with preheating, baking and cooling zones; a continuous thermal shock testing machine for armor-piercing and semi-armor-piercing shot; and a festoon-type oven for processing continuous cloth.

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IN THE back of the book are tables of engineering data relating to gases, various materials, air and to fan laws.

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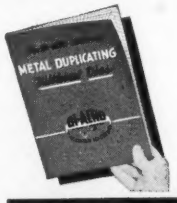

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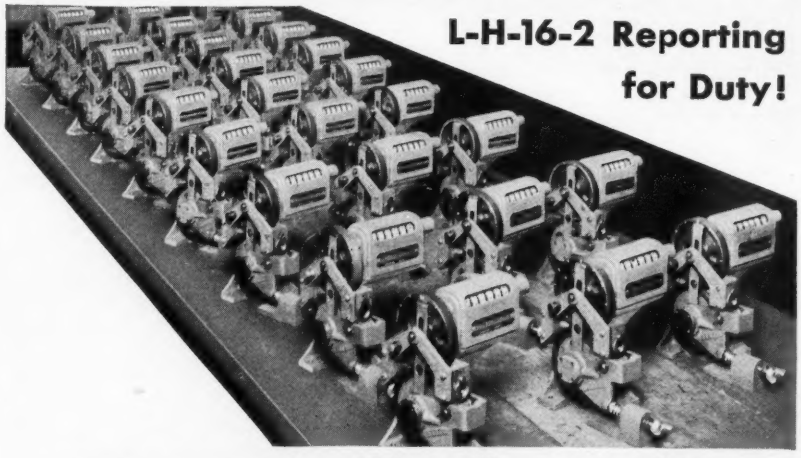

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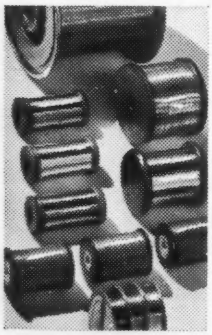

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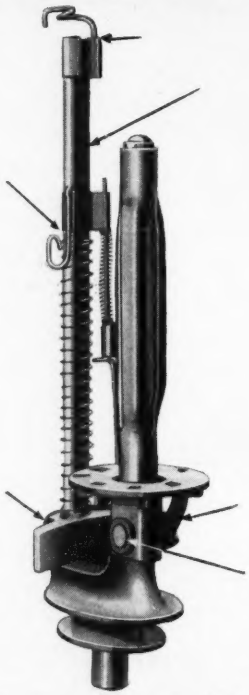

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Institute of Bolt, Nut and Rivet Manufacturers to Establish Aircraft Fasteners Division

MEMBERS of the American Institute of Bolt, Nut and Rivet Manufacturers have authorized the setting up of an Aircraft Fasteners Division to function for them in aircraft products. In the last few months there has been a great increase in the number of matters relative to aircraft fasteners that have been taken up with the Institute by various interested people. Requests for information have been received from the Interdepartmental Screw Thread Committee, Army-Navy Aeronautical Board, Wright Field, Army-Navy Air Corps, Society of Automotive Engineers, and the War Production Board as well as from many small manufacturers, the Institute said.

✦ ✦ ✦

THE questions that have come up from time to time have been in connection with steels, cadmium plating, plating tolerances, and decarburization; questions as to standards in dimensions and tolerances, sources of supply, etc.

✦ ✦ ✦

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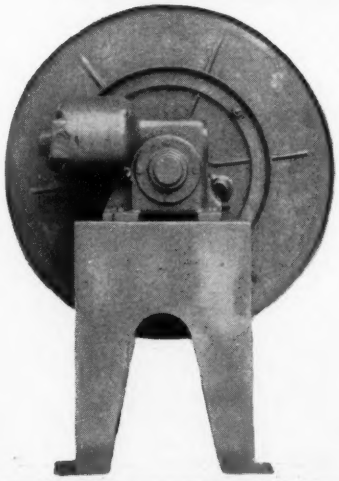

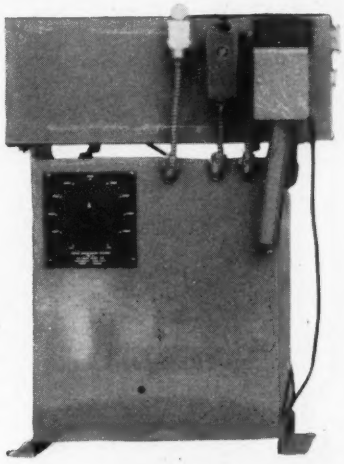

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✦ ✦ ✦

AN appendix includes tables, trade names of chemicals, a list of sellers of chemicals and supplies, foreign and domestic and a list of useful reference books.

✦ ✦ ✦

THIS book is published by the Chemical Publishing Company, Inc., Brooklyn, N. Y., and sells for $6.00 a copy.

✦ ✦ ✦

Circular On Wire Forming

THE **Union Steel Products Company,** Albion, Michigan, has issued a folder indicating the wide variety of products that may be made from wire. The Company fabricates wire parts and products, and in this folder point out that wire, coming as it does in many sizes, shapes and metals, can be used to form strong, durable and inexpensive products with almost any desired finish, as it can be bent, woven, soldered, or welded to provide almost unlimited possibilities in design and use.

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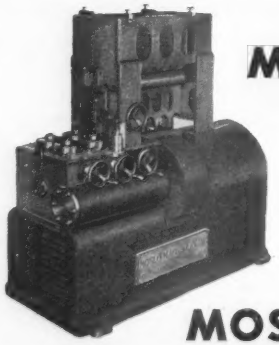

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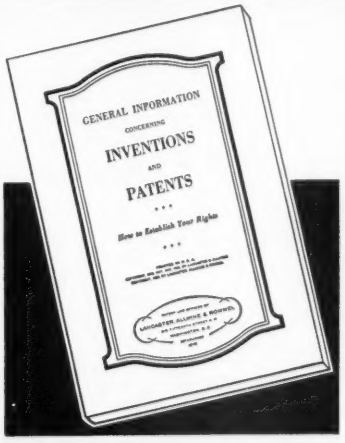

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New Booklet on Wire Cutters

H. K. PORTER, INC., of Everett, Mass., has issued a 48-page booklet on the care and repair of wire cutters with the object of helping users to get the most out of these tools.

✦ ✦ ✦

THE publication is profusely illustrated, and contains information on the selection of the right cutters for different materials and purposes, how to use cutters, how to adjust cutting edges, how to repair cutterheads and handles, how to assemble the tools, and in the back, a ten-page section is devoted to the use and care of cold chisels, files, hammers, saws, dulls, taps and dies, and high-speed cutting tools.

✦ ✦ ✦

EVERY plant should have a copy in its shops as it is a practical treatise that will help foremen and workers to use and maintain tools correctly. The Company will be glad to send copies to interested persons.

✦ ✦ ✦

Gold Braid Is Made Of Silver

EVERYTHING made for our armed forces must be right and rightness is usually a matter of testing. The materials and equipment that go into armament are all put through their paces before being sent into action. The practice extends even to the gold braid for officers' uniforms, that must endure through exposure and wear.

✦ ✦ ✦

IT was no surprise, therefore, when the Lucius Pitkin Laboratories, of New York, which serves the war effort in many ways, was recently called upon to make tests of several grades of gold braid and to report which would be best for their purpose. Gold braid is now made of silver wire, and given a gold coating.

✦ ✦ ✦

IN the Pitkin Laboratories, tests were run which subjected the braid to the wear that would normally be expected over a long tour of duty. As a result, our officers are being supplied with braid that should retain its proper appearance for the life of the uniform.

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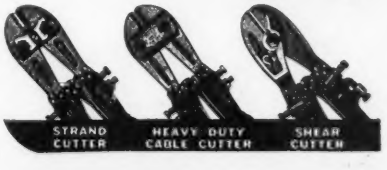

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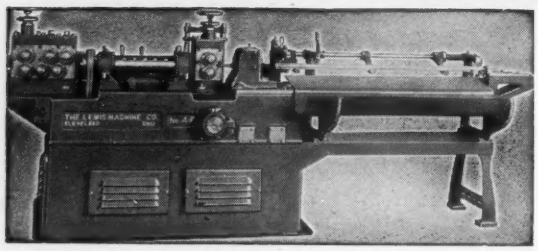

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Two Hints on Metal Conservation

AMONG the many new ideas introduced in General Electric factories for conserving copper, steel, and the other metals, have been two recent instances, reported from one plant, of a type applicable in many industries. Both have to do with getting more out of less.

✦ ✦ ✦

Scrap Copper Utilization

THE production of busbars from ¼-inch copper bar stock entailed considerable drop-offs or unused ends, often of fair size. The procedure had been to accumulate all such scrap for transfer to the Salvage Division for the use of the foundry in making copper and copper-alloy castings.

✦ ✦ ✦

A MORE efficient utilization of this scrap, particularly in view of the copper shortage situation, was found to be to save all pieces having an area of four square inches or more; to separate the odd-size pieces for the manufacture of washers and spacers; and to retain the more regular sizes for use in the manufacture of larger parts.

✦ ✦ ✦

WITH this scheme, some ninety per cent of the orders for parts less than eight inches long, and to be made from ¼-inch copper, are being filled with the use of copper scrap. An annual saving of 125,000 pounds of new bar copper stock is estimated.

✦ ✦ ✦

Using Scrap Steel

A SOMEWHAT similar story can be told about the utilization of scrap steel in the same division of the company. In the manufacture of switchgear panels a considerable tonnage of carbon panel steel scrap is produced each year in primary shearing operations. Formerly this scrap was largely collected and sold to scrap dealers, but with a certain percentage utilized in making other steel parts.

✦ ✦ ✦

WITH the present steel shortage, the scrap is accumu-

lated and sorted, and all pieces with an area of 50 square inches or more saved. This scrap is then divided into two assortments, of long and short pieces, for use in the production of a large number of various small parts.

✦ ✦ ✦

DURING a recent six-weeks' period, 40,000 pounds of such sorted scrap were so used, and it is estimated that 800,000 pounds of material will be saved annually in just this one division. With a finer sorting of the scrap in the Salvage Division, it is expected that a million pounds can be reclaimed for further manufacture of the same order.

✦ ✦ ✦

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AS another contribution toward winning the war and combating inflation, we have instituted what we believe is a new type of discount. We call it a "Special 1943 War Discount."

✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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SURFACE Combustion, Toledo, Ohio, offers to interested persons a new 12 page booklet entitled "The SC Primer of Prepared Atmospheres". This embraces seven different types of furnace atmospheres, their preparation, application and relative cost. A valuable feature is a page of tables showing the composition, reaction and applications of the various atmospheres. Just ask the company for folder No. SC-107.

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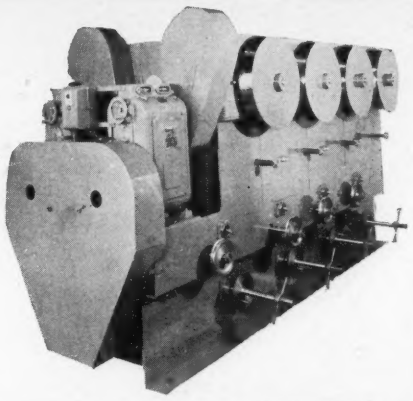

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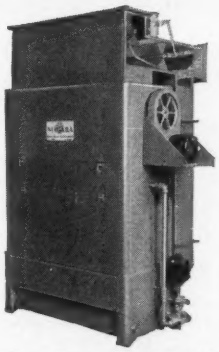

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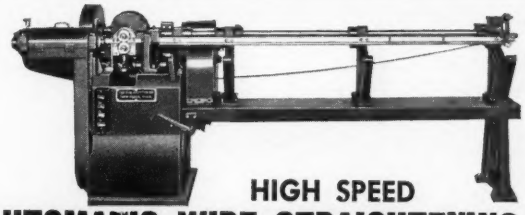

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Controlling Factory Production

CAREFULLY planned production control in plants—small, medium, or large—has enabled manufacturers of wartime goods to double their output without undergoing serious disruptions despite machine and manpower limitations. The means used to help accomplish such intensive controlled production, avoiding idle equipment and inefficient scheduling, are made the subject of a report recently issued by the Policyholders Service Bureau, Metropolitan Life Insurance Company, entitled "Controlling Factory Production."

✦ ✦ ✦

THIS report is concerned with the time element in manufacturing and in related functions, viz., the question of when given quantities of goods are to be produced. This includes the problems of meeting promised delivery dates, maintaining a steady flow of work in the shop, properly utilizing the available equipment and manpower, and avoiding congestion in the plant. All these objectives require strict adherence to standardized procedures which operate, to a large extent, through the medium of time-control forms and supplementary records. A variety of these forms and records, as well as suggestions as to their practicability and use, are discussed in "Controlling Factory Production."

✦ ✦ ✦

MUCH emphasis is placed on scheduling and progress control as fundamental considerations in production control. The report describes the scheduling of work both in jobbing shops and in factories having continuous-flow production, and cites methods by which the former type of company often capitalizes on the

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easier planning problem of the latter. Separate descriptions are given of the scheduling in small, medium-sized, and large shops. Machine-load control, which is designed to minimize bottlenecks, is described and illustrated, and typical expediting procedures are outlined.

✦ ✦ ✦

EFFECTIVE production control, the report states, depends on the existence of a number of operations or types of information which are not in themselves a part of the control procedure. This information, which varies in importance with the size of the concern and the complexity of its operations, is tabulated to show its need in small, medium, and large companies—a check list useful to many executives in analyzing the basis for control system.

✦ ✦ ✦

"CONTROLLING Factory Production" also outlines the functions of the foreman and the supervisor in executing planned production.

✦ ✦ ✦

COPIES of this report are available to executives who address the Bureau on their business stationery. Address: Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue, New York, N. Y.

✦ ✦ ✦

Metal Working in Powder Metallurgy

(*Continued from Page 395*)

or 95-98 per cent. Only the final drawing into wire size as fine as 0.05 mm. in diameter brings the density up to 10.20 grams per cubic centimeter, i.e. 99 per cent of the theoretical density of molybdenum (10.3 grams per cubic centimeter). Figure 5 shows a similar diagram for the variation in hardness of sintered and worked molybdenum. The hardness of a "high"-sintered bar, 10 x 10 mm. in cross sectional area is 156 Brinell, and this figure is further increased to 229 Brinell after hot-rolling the material to sheet of 8 mm. thickness. For molybdenum sheet hot rolled to 1 mm. thickness, this figure increases to 255 Brinell.

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✦ ✦ ✦

IN a drastic streamlining program, the company reduced its radio line from 467 to 171 items, the automotive line from 249 to 93 items, and made large reductions in its other divisions. The effect on the automotive line is to make a minimum amount of critical materials service a maximum number of essential cars and trucks, save more than one-third in the consumption of copper and other critical materials, function similarly in other lines, and add to war goods production thousands of hours of machine capacity heretofore lost because of stoppage for re-setting purposes.

✦ ✦ ✦

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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BERYLLIUM COPPER — Strip and Bars
Callite Tungsten Corp., Union City, N. J.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.

CABLE LACQUERING OVENS
Industrial Oven Engr. Co., Cleveland, Ohio.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Carter, B. & F., & Co., Ltd., Bolton, England.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.

WHERE TO BUY, Continued

Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Haveg Corporation, Newark, Del.
Morgan Construction Co., Worcester, Mass.
Nukem Products Corp., Buffalo, N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Cleveland, Ohio

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Inc., Cleveland, Ohio.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CONTROLS—Heat Treating
Niagara Blower Co., Buffalo, N. Y.

CONTROLS—Temperature
Niagara Blower Co., Buffalo, N. Y.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Callite Tungsten Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIE MAKING MACHINERY — For Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING EQUIPMENT—
Niagara Blower Co., Buffalo, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Humidifying
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Industrial Cooling
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Hardening & Tempering
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Robertson, John, Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin, Wm. M., Co., The, Pittsburgh, Pa.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—
Warner Co., Philadelphia, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
National Wire Machinery Co., Lynn, Mass.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
National Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Wire Machinery Co., Lynn, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery, Inc., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Hydraulic Testing
Riehle Testing Machine Div. of American Machine & Metals, Inc., East Moline, Ill.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
National Wire Machinery Co., Lynn, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Wire Machinery Co., Lynn, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Riehle Testing Machine Div., American Machines & Metals, Inc., East Moline, Ill.
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
National Wire Machinery Co., Lynn, Mass.
Shuster, F. B., Co., New Haven, Conn.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
National Wire Machinery Co., Lynn, Mass.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Wire Machinery Co., Lynn, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

WHERE TO BUY, Continued

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
Industrial Oven Engr. Co., Cleveland, Ohio

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PIPES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery Co., Cleveland, Ohio
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Keagler Brick Co., Steubenville, Ohio.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Riehle Testing Machine Div. of American Machine & Metals, Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

HUDSON WIRE COMPANY

PRODUCERS OF FINE WIRES IN ALL METALS

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18% and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickle Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

Look for the name — **HUDCO** — A guarantee of quality

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

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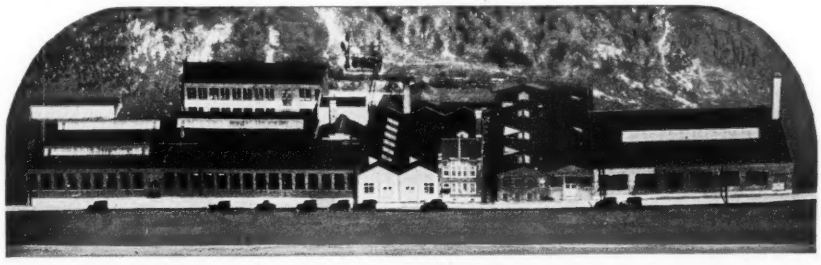

"HUDCO" PLANT AT OSSINING, NEW YORK

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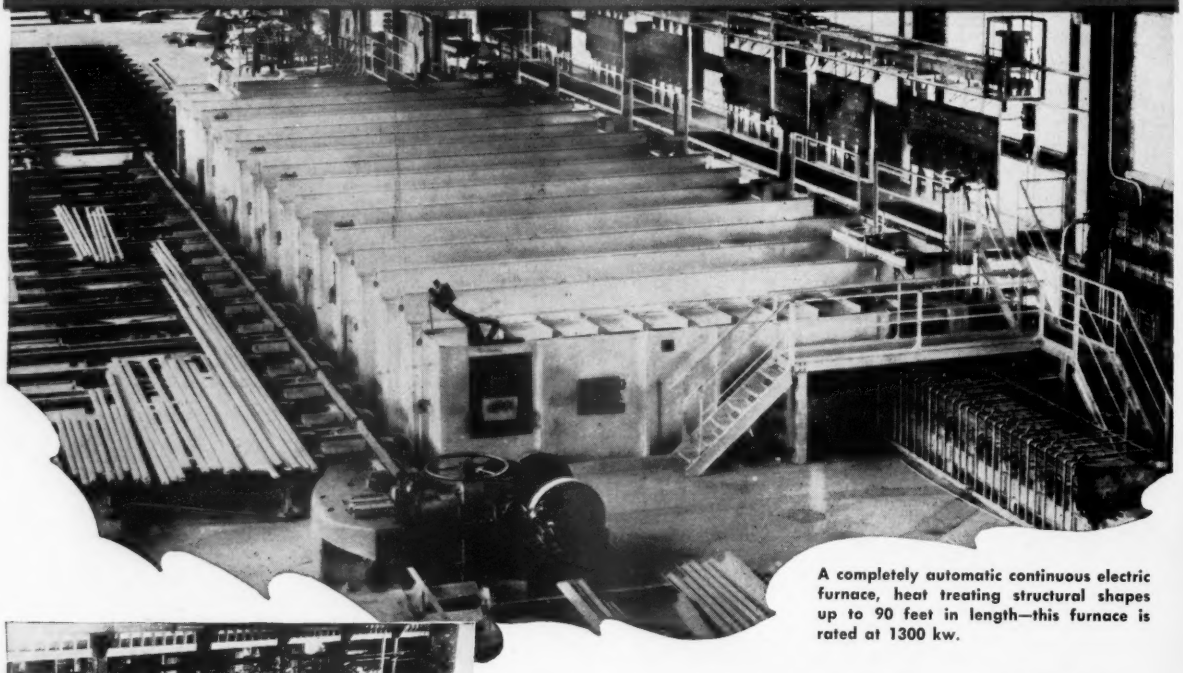
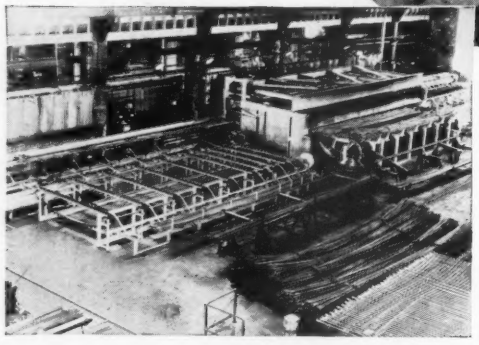
For Every Industrial Heat Treating Process



A completely automatic continuous electric furnace, heat treating structural shapes up to 90 feet in length—this furnace is rated at 1300 kw.



A gas fired heat treating furnace, quenching machine and rod straightener—handles rods up to 30 ft. in length—continuously.

93 ft. Long x 26 ft. Wide Maintains Temperature ± 5°

Because of its great number of successful, large and unusual furnace installations, The Electric Furnace Co. has justly earned an enviable reputation for solving difficult production furnace problems.

The two furnaces shown are typical examples—the large aluminum furnace above is completely automatic—large structural shapes up to 90 ft. in length are automatically charged into the furnace, carried across the heating chamber and discharged through a spray quench—everything automatic.

The heating chamber is 93 ft. in length by 26 ft. in width. Despite its unusual size it maintains a uniform temperature throughout the entire heating chamber. To our knowledge this is the largest furnace of this type ever built for this purpose.

The furnace shown at left is another outstanding installation—this equipment heats, quenches and straightens rods up to 30 ft. in length and was the first successful continuous furnace of this type built for this process. Several somewhat similar installations have since been made.

If you have a difficult production furnace problem put it up to our experienced engineers—No job is too large or too unusual.

ELECTRIC AND FUEL FIRED EF FURNACES

More recent outstanding production furnace installations include furnaces for bright annealing both ferrous and non-ferrous strip, wire, tubing and other products . . . furnaces for the production heat treatment of tank armor castings, cartridge cases, shell forgings, bomb and gun parts, machine gun cartridge clips, aircraft and aircraft engine parts, aluminum and magnesium castings, bolts, springs, and many other allied products.

We specialize in designing and building *production* furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production